

**MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY  
PERMITTING AND COMPLIANCE DIVISION**

**RECORD OF DECISION**

**For**

**TVX Mineral Hill, Inc.**

**Operating Permit No. 00100**

**Amendment 002**

**Consolidated Closure Plan Modifications**

**May 10, 2001**

**I. Introduction and Background**

TVX Mineral Hill, Inc. (TVX) produced gold at the Mineral Hill Mine near Jardine, Park County, Montana, under Operating Permit No. 00100, from 1989 through September 1996. The original permit was issued on February 14, 1988. Since then, one amendment and 19 modifications have supplemented the permit. The permit covers 424 acres. The site consists of the mine, processing facilities, the Jardine Historic District, and the tailings storage facility. A total of 69 acres have been disturbed to date as part of Operating Permit 00100.

TVX, through its mine operator Amerikanuak, Inc., plans to reclaim the mine site completely. TVX, in its Consolidated Closure Plan (CCP), proposes to modify the approved reclamation plan. The revegetation plan would also be modified.

The tailings storage facility (TSF) would receive a 48-inch water balance cap, instead of the currently approved 15-inch water barrier cap over a 9-inch compacted bentonite-amended layer of tailings. Any seepage that would eventually reach the TSF underliner would be treated in a biological treatment system and habitat development site, instead of in a reverse osmosis plant.

The majority of the water from the Crevice Adit would be conveyed in a buried pipeline to Bear Creek. The Crevice Adit water meets all water quality standards. Up to 50 gpm of the water from the Crevice Adit would be conveyed to a storage tank for potential domestic use and fire protection in the Jardine area.

The 1300 Adit water would be treated in a chemical addition building with ferric sulfate to remove arsenic and then discharged to the existing septic drainfields. The Draft and Final Environmental Impact Statements (EIS) examine the impacts of the CCP and alternatives.

The Montana Department of Environmental Quality (DEQ) must decide whether to permit the CCP and what mitigation measures to impose to reduce environmental impacts. DEQ must also decide on revisions to the Montana Pollutant Discharge Elimination System (MPDES) Permit No. MT-0030252 for

water discharges to Bear Creek and groundwater. These decisions are documented below.

## II. Decisions

After considering the proposal, issues, alternatives, potential impacts, public comments and management constraints, DEQ has selected the **Agency Modified Plan**. The proposed action, as modified by DEQ, is approved for implementation as described in this Record of Decision (ROD).

Mitigation measures to reduce environmental impacts and to improve the potential for long-term reclamation success will be stipulated to Amendment 002 to the operating permit before this decision can be implemented. This approval is given under the authority of the Metal Mine Reclamation Act (MMRA). The **Applicant's Proposed Plan** and the **Agency Modified Plan** are described in detail in **Chapter 2** of the Draft EIS.

## III. Amendment 002 Stipulations

Stipulation 100-002-01: TVX must construct the tailings storage facility (TSF) treatment systems and pipelines in 2001. TVX must submit final designs to DEQ for review and approval before implementation. If the TSF seepage biological treatment system is shut down for repairs or maintenance, TVX must implement the following contingency plans. In Option A, which is the first contingency to be implemented, TVX must add up to 184 gpm of Crevice Adit water to the TSF seepage pipeline, to meet the groundwater arsenic standard of 0.02 mg/l, before the water enters the upland habitat development site (HDS). The mixed water must be monitored before it enters the upland HDS.

If Option A is not implementable for any reason, TVX must implement Option B. In Option B, TVX must add up to 200 gpm of Crevice Adit water to the TSF seepage in the wet meadow HDS. Overflow from the wet meadow HDS must report to an ephemeral drainage for discharge into Bear Creek. The quality of the overflow must be monitored, and the mixture of Crevice Adit water and TSF seepage adjusted to meet requirements of the MPDES permit. A new Outfall 006 must be added to the MPDES permit. See Figure 1, Options A and B in **Appendix D** of the Draft EIS for a conceptual drawing of the contingency plans.

Rationale: These contingencies will ensure impacts from TSF seepage will be prevented if the treatment system is shut down for repairs or maintenance and will ensure compliance with water quality standards.

Stipulation 100-002-02: TVX must submit design drawings for the proposed 1300 Adit discharge chemical addition building and pipelines for DEQ review and approval. The treatment system and pipeline must be constructed in 2001. An additional water quality monitoring station must be established to monitor the

effluent from the chemical addition building after the ferric sulfate addition and mixing. Monitoring must also be performed 12 times per year in the dosing tank before discharge of water to the drainfields.

Two contingencies have been developed. In Option C, if the treatment system is down for repairs or replacement, TVX must mix up to 190 gpm of Crevice Adit water with the 1300 Adit water prior to discharge to groundwater. TVX must also bury the existing 1300 Adit discharge pipeline to Bear Creek. In Option D, if the ferric sulfate coprecipitation system needs maintenance or repairs, Crevice Adit water must be mixed with the 1300 Adit discharge and Outfalls 003 and 001 must be used. See Figure 1, Options C and D in **Appendix D** of the Draft EIS for a conceptual drawing of the contingency plans.

**Rationale:** These contingencies will ensure impacts from 1300 Adit discharge will be prevented if the treatment system is shut down for repairs or maintenance and will ensure compliance with water quality standards.

**Stipulation 100-002-03:** TVX must construct the new Crevice Adit water systems in 2001. Final design plans must be submitted for agency review and approval before construction. TVX would be required to use the Crevice Adit water in other contingency options if needed for treatment of TSF seepage or the 1300 Adit discharge.

**Rationale:** This use of Crevice Adit water will ensure impacts from the 1300 Adit discharge and TSF seepage are prevented.

**Stipulation 100-002-04:** TVX must hire a mined land revegetation specialist to prepare a revised revegetation, revegetation monitoring and noxious weed monitoring and soil amendment plan based on recommendations in **Appendix B** in the Draft EIS. The revegetation plan must include a revised seed mix and seeding rate for the site that would favor survival of tree and shrub species, allow natural invasion of other native species, and control erosion. The plan would include more tree and shrub planting on the slopes of the TSF. The plan must ensure adequate measures are taken to guarantee dominance by trees and shrubs, especially on the TSF.

This revegetation monitoring plan must specify the methodologies for annual measurements to be employed in the monitoring, length of monitoring and reporting frequency. Monitoring must include vegetative canopy cover, production, and species diversity, woody plant survival, soil microbe community dynamics, soil fertility, noxious weed control, invasion by other native species and erosion. If vegetative canopy cover and species composition on revegetated areas are less than the Ecological Dynamic Simulation model's (EDYS) second year predictions, TVX must propose and implement remedial vegetation enhancement.

TVX must continue to monitor and control noxious weeds on revegetated areas at least until the Douglas fir seedlings are well established. Spot spraying must be used for weed control to prevent injury to desirable trees and forbs that become established.

The revegetation specialist must provide recommendations for fertilizer and organic matter amendments and application rates. TVX must use wood waste organic amendments for areas to be dominated by trees and shrubs, especially on the TSF.

The revised plans must be submitted to DEQ before revegetation commences in 2001. TVX must fence the TSF to protect the shrubs and trees from browsing animals until they are successfully established.

Rationale: These plans are needed to ensure revegetation success. The revegetation plan will help provide for the timely establishment and long-term survival of vegetation for erosion and seepage control. These measures will help encourage more Douglas fir survival and growth and natural invasion by other native species. Dominance of deep-rooted Douglas fir on the TSF will reduce the long-term potential for water quality problems from TSF seepage by removing water from the water balance cap through evapotranspiration. A dense stand of trees will reduce long-term noxious weed survival on the TSF. The use of wood waste will help ensure dominance by Douglas fir and reduce the long-term risk of noxious weed invasion on the TSF.

Monitoring will ensure problems are identified so modifications can be made as needed.

Stipulation 100-002-05: TVX must monitor flows at the spring above the Old Tailings North area.

Rationale: This stipulation will ensure that the 1300 Adit discharge being added to the septic system does not exceed drainfield capacity.

Stipulation 100-002-06: TVX must sample for thiocyanate in the TSF seepage before and after the biological treatment system until the agency agrees that thiocyanate concentrations are not a problem.

Rationale: This will ensure that thiocyanate does not kill the vegetation in the wet meadow HDS.

Stipulation 100-002-07: TVX must submit a revised detailed monitoring and maintenance plan updating the CCP to reflect accurately the changes made through the EIS and this ROD. This plan will be due to DEQ by the end of 2001.



Rationale: These changes updating the CCP will make them an enforceable part of Operating Permit 00100.

Stipulation 100-002-08: TVX must provide replacement pages for the CCP document incorporating all stipulations as part of the CCP requirements.

Rationale: Incorporation of the stipulations into the CCP makes them an enforceable part of Operating Permit 00100.

Stipulation 100-002-09: If TVX does not complete construction of the water treatment systems in 2001, then DEQ will bond for their construction.

Rationale: TVX has constructed portions of the water treatment systems. TVX has committed to construct the rest of the treatment systems in 2001. DEQ has not bonded for the direct costs of construction. This stipulation will ensure that the treatment systems will be bonded if TVX does not complete its performance schedule.

Stipulation 100-002-09: If TVX converts the letter of credit to a surety bond, then DEQ will recalculate the bond costs associated with Interim Maintenance and Shutdown.

Rationale: DEQ has not included the extra costs associated with collecting a surety bond in the bond calculations. A letter of credit is a much more liquid financial instrument. This stipulation ensures that DEQ would have the ability to bond for extra money to collect on the surety bond.

#### **IV. Implementation**

This decision is effective upon signing of this ROD. TVX may implement surface disturbing activities immediately. The reclamation performance bond must be submitted to DEQ within 30 days of this ROD.

##### **A. Other Rights and Permits**

Approval of the permit amendment does not convey or create any real property rights or use rights.

TVX's Storm Water Pollution Prevention Plan (SWPPP) was approved under General Discharge Permit for Storm Water Authorization MTR300232. TVX also holds Authorization to Discharge under the Montana Pollutant Discharge Elimination System (MPDES) MT-0030252.

TVX holds Air Quality Permit #2087-06.

TVX is responsible for obtaining any property rights, easements, mineral rights, or water rights necessary to implement the operating permit amendment. TVX is responsible for obtaining any other local, state, or federal permits, licenses, or reviews that might be necessary to implement the operating permit amendment.

During implementation of this decision, TVX may propose waivers, exceptions, or modifications to the reclamation plans and associated stipulations or conditions. Such changes could be appropriate to allow the use of alternate mitigation methods that might be developed in the future, or to respond to an improved understanding of site conditions gained through operational experience.

Any proposed changes to the operating procedures, schedule, reclamation design, or mitigation measures will be reviewed by DEQ and accepted if the change would provide resource protection equal to or greater than the original requirement, and would not result in significant impacts not identified in the EIS. Proposed changes that would not achieve the same level of resource protection, or would result in previously undisclosed significant impacts, would require supplemental environmental analysis prior to determining their acceptability.

## **B. Reclamation Bond**

A reclamation bond is to be posted and maintained in an amount that would enable DEQ to implement the reclamation and other plans as stipulated above and in prior amendments should TVX be unable or unwilling to do so. The reclamation bond may be posted incrementally or released to reflect stages of performance of reclamation, but will always remain at an amount adequate to pay for the reclamation of any disturbance that might exist.

The bond is reviewed once a year by DEQ as part of an annual bond oversight process required by the MMRA, Section 82-4-338, MCA. The entire reclamation cost estimate will be reviewed and adjusted by DEQ at least every 5 years as required by the MMRA to account for changes in reclamation costs and inflation. The public will be notified of the results of the 5-year bond review process and any proposed bond releases and will be provided the opportunity to comment. The reclamation bond does not represent the limits of TVX's liability should actual reclamation performance fail to meet the requirements in the reclamation plan or comply with environmental laws.

In complying with the full extent of the MMRA, Section 82-4-338, a reclamation bond has been estimated for the Mineral Hill Mine reclamation plan. Based upon the information submitted, the bond has been estimated at \$3,348,000 for reclamation activities and \$5,189,000 for water treatment, for a total of \$8,537,000. Interest rates or indices used to calculate the bond amounts may change with time. Therefore, any bond amounts used in the ROD are subject to change over time.

This bond estimate has been prepared for the selected alternative (see attached Bond Summary Sheet in Appendix ROD-A). Provisions in the stipulations are included as line items and contingencies within the bond as needed. Supporting details of the bonding summary are available from DEQ. Line items prepared by the DEQ to determine the total amount of the letter of credit bond required are not limitations on how the DEQ may spend any of the bond proceeds from the letter of credit.

This bond estimate has been divided into specific items:

- (1) **Facilities** includes collecting and disposing of petroleum waste, removing abandoned equipment and materials, demolishing structures and removing debris, recontouring the facilities area and other building sites, hauling and spreading soil, and establishing vegetation and weed control.
- (2) **Tailing Storage Facility** includes constructing diversion ditches and haul roads, constructing the water balance cap, and establishing vegetation and weed control.
- (3) **Old Tailings South** includes establishing vegetation and weed control.
- (4) **Roads** includes reclaiming roads.
- (5) **Underground Openings** includes closing the 1050 Level Portal, closing the 1200 Level Portal, backfilling vent and fill raises, closing the 610 Level Portal, and replacing bat grates at the Last Chance Portal and Crevice Adit.
- (6) **Development Rock Piles** includes regrading, placing topsoil, seeding and weed control on Top of Mineral Hill, the 450 Level Dump, and the 750 Level Dump, reclaiming the 1050 Level Dump, reclaiming the 1200 Level/34000 Ton Dump, regrading, placing topsoil, seeding and weed control on the 13038 Ton Dump, and reclaiming the 610 Level "Crevice" Dump.
- (7) **Miscellaneous** includes surveying and staking, abandoning septic tanks, reclaiming the alluvial material source site, abandoning water lines, cleaning up and seeding laydown sites, reclaiming topsoil stockpile areas, and installing a fence around the TSF.
- (8) **Interim Maintenance and Shutdown** includes attorney fees for managing letter-of-credit bonds.

- (9) **Site Management During Reclamation** includes retaining a third-party engineering firm to manage the site, including labor, power, insurance, taxes, leases, vehicles, computers, etc.
- (10) **Water Treatment** includes the costs of water monitoring, MPDES permit, well abandonment, Well #10 remediation, TSF seepage biological treatment system and wet meadow and upland HDS, TSF seepage discharge contingencies, 1300 Adit discharge chemical addition system and septic tank, 1300 discharge contingencies, Crevice Adit water system, and temporary reverse osmosis treatment plant.

Other costs associated with the reclamation of the Mineral Hill Mine include contingencies (5%), mobilization (5%), engineering design (5%), agency administration (5%), and inflation (3% over 5 years, or 16%).

As noted above, TVX may implement the decision immediately when the ROD is signed and TVX receives the Operating Permit 00100, Amendment 002 approval form. The bond must be submitted within 30 days after the ROD is signed.

The final bond amount includes reclamation costs associated with disturbance created by TVX under Exploration License 00559. Once the new bond is posted and approved by DEQ, DEQ would release the existing exploration bond letter of credit and place the exploration license inactive.

Bond release may be requested incrementally by TVX as completed activities meet the reclamation standards outlined in MMRA. When bond release is requested, DEQ will evaluate the request and solicit public comment as required by Section 82-4-338, MCA, prior to making a decision.

## **V. Issues and Alternatives**

The EIS and this ROD have been prepared in response to TVX's application and issues and concerns identified through public comment. An alternative was developed to address significant issues. These issues and the alternative are summarized below and presented in detail in the Draft EIS. The preferred alternative identified in the Draft EIS is the **Agency Modified Plan**. This alternative has also been selected for implementation following preparation of the Final EIS. This decision took into account the impacts of the alternatives as well as public comment and the potential for the alternatives to resolve the issues.

### Public Scoping and Comments

A notice was sent out on May 24, 2000, announcing the public scoping meeting. The scoping meeting was held in Gardiner on June 15, 2000. Six people signed the attendance list.

The Draft EIS was released February 13, 2001. The Draft EIS presented three alternatives, including the no action alternative, TVX's proposed action, and the preferred alternative. The Draft EIS disclosed the affected environment and the environmental consequences of each alternative.

A public hearing was held in Gardiner on March 7, 2001, to receive oral comments on the Draft EIS. Twenty people signed the attendance list. Four people presented comments. Thirteen letters and e-mail messages were also received. The public review period ended on March 20, 2001.

All comments were reviewed and considered during preparation of the Final EIS. Comments that presented new data, questioned facts or analysis, or raised questions or issues bearing directly on the alternatives or environmental analysis received a response in the Final EIS. Comments expressing personal opinions were considered but drew no response.

A bond release hearing was held on April 26, 2001 in Gardiner. Six people attended the hearing. Comments received on the bond were used to calculate the final bond amount (See the attached Table H-1 Final Bond Summary Sheet in **Appendix H**). Also see **Appendix H** for the responses to public comments received at the bond hearing and from letters received during the bond release comment period.

## **A. Issues and Alternative Development**

**Appendix A** of the Draft EIS describes the issues raised by agency specialists and the public. Significant issues that received detailed study are described in **Chapter 2** of the Draft EIS and are summarized below.

### Issue 1. Tailings Storage Facility (TSF) – Biological Treatment System, Cap Design

Residual drainage from the reclaimed TSF would continue indefinitely. The existing approved plan does not include water treatment. The proposed action would employ a biological treatment system and wet meadow habitat development site that has been successful elsewhere. Concerns have been raised regarding the proposed TSF seepage biological treatment system and the effectiveness of the proposed water balance cap design in reducing infiltration. Effects from the TSF cap design alternatives, such as revegetation potential, root penetration, tree fall, fire and climatic effects, are of concern. Long-term water treatment of TSF seepage is also a concern.

### Issue 3. Crevice Adit Water System Design

Water discharges from the Crevice Adit to Outfall 001 are currently permitted under an MPDES permit. Three outfalls to Bear Creek have been permitted. The first is the discharge from the TSF underdrain system following treatment. The second is a combined outfall of the two mine drainage sources: 1) the Crevice Adit water, which is of high quality and requires no treatment prior to discharge, and 2) the 1300 Adit water, which has elevated levels of arsenic, and is discharged to Outfall 003.

The combination of the two mine discharges results in no measurable impact to Bear Creek water quality. Proposed reclamation activities would modify the Crevice Adit water system design in that the pipeline from the Crevice Adit to Bear Creek would be buried below frost depth. The 1300 Adit drainage line would be separated from the Crevice Adit drainage line.

Concerns have been expressed about the changes to the existing systems because the water currently meets water quality standards before discharge to Bear Creek.

### Issue 4. 1300 Adit Drainage

Under the proposed plan, discharge of 1300 Adit water directly to Bear Creek would be eliminated. The 1300 Adit discharge line would be separated from the Crevice Adit water line, buried, and the drainage treated in a chemical addition building with ferric sulfate and routed to the existing septic tank. The treated effluent would be discharged from the dosing tank into the two drainfields at Outfall 005.

Concerns have been raised about the effectiveness of this proposed system and long-term care and maintenance of the system.

### Issue 5. Long-Term Monitoring and Maintenance

The proposed plan contains a long-term monitoring plan designed to test for the success or failure of reclamation. Funding of the ongoing monitoring and maintenance requirements is an important consideration. The current bond would be revised to reflect agency evaluation of the cost to support long-term monitoring and maintenance activities and to reflect reclamation performed to date.

Many concerns were expressed about the amount of bond needed for long-term management of the three proposed water systems. Also, questions were raised about what would happen to the bond if TVX donated the property to the USFS.



#### Issue 7. Future Land Use

The applicant has proposed donating the 556-acre patented surface and mineral estates to the USFS. As donated lands, the site would be managed as an "acquired" land donation. Acquired lands are not subject to the 1872 Mining Law. The USFS can prohibit mining without withdrawing the lands from mineral entry. The USFS has suggested the site would be managed for recreation, historic interpretation, and education. DEQ would evaluate the reclamation and water management activities with USFS review in light of potential future management of the site by the USFS.

#### Issue 9. Revegetation

Concern has been expressed regarding the vegetation communities that would be established by reclamation activities, especially on the TSF. Other concerns have been raised about long-term effects from grazing, fire, and tree dominance on the TSF. Concerns have also been expressed because TVX has proposed the use of imported soil and organic matter amendments. These materials may increase revegetation success but may introduce noxious weeds.

#### Issue 10. Noxious Weeds

TVX has conducted a weed control program through mechanical and chemical means for many years. An issue has been raised regarding continuing successful noxious weed control during and following reclamation especially when and if the USFS takes over the property. Concerns have been expressed because TVX has proposed the use of imported soil and organic matter amendments. These materials may increase revegetation success but may introduce noxious weeds, especially spotted knapweed.

#### Issue 11. Bond

An important aspect of the MMRA permitting system is to ensure adequate financial resources are available to reclaim mining sites in the event the operator becomes insolvent or is no longer available to perform the permitted reclamation. The appropriate bond for the proposed plan and alternatives will be assessed. An important scoping issue in the EIS is the amount of bond needed for reclamation. TVX would be required to modify the current bond amount to reflect the selected closure plan.

#### Issue 16. Groundwater

The presence of nitrate and arsenic in groundwater has been raised as a scoping issue. Effects on groundwater of the proposed TSF seepage treatment system and 1300 Adit discharge in the septic tank drain field are also of concern.

## Issue 18. Wildlife – Bats

The potential impact to bats has been raised as an issue to be considered.

### **B. Alternatives Considered in Detail**

**Chapter 2** of the Draft EIS describes the alternatives analyzed and the alternatives excluded from detailed analysis. The alternatives that were studied in detail are the **Applicant's Proposed Plan**, the **Agency Modified Plan**, and **No Action**.

### **C. Environmentally Preferred Alternative**

The **Agency Modified Plan** is the environmentally preferred alternative. The two water-handling contingency plans added to the TSF seepage treatment system would ensure that water quality standards are met in wet years and in the event the biotreatment system is down for repairs or maintenance. The modified seed mixes and seeding rates would ensure the invasion and survival of woody plants on the TSF. Biomass production on the revegetated TSF would be the highest of any of the plans because Douglas fir survival would be ensured. Woody plants use more water than grasses do, ensuring the seepage-reducing function of the revegetation.

Two contingencies added to the 1300 Adit discharge treatment system would ensure that the discharge would meet groundwater standards. No contingencies are needed to ensure the Crevice Adit water meets water quality standards, but DEQ has designed other contingencies to use the Crevice Adit water if needed if the other TSF and 1300 Adit systems are down for repairs or maintenance.

## **VI. Rationale for the Decisions**

### **A. Rationale for the Selected Alternative**

DEQ has selected the preferred alternative, **Agency Modified Plan**, after considering the potential impacts of all of the alternatives. The selected alternative reduces adverse environmental impacts by imposing conditions that enhance reclamation success and water quality protection. DEQ recognizes that none of the alternatives, including the selected alternative, completely avoids environmental impact.

## **B. Selected Alternative Compliance with Legal and Policy Mandates**

This section explains how the selected alternative satisfies DEQ's major statutory, regulatory, and policy mandates.

### Montana Metal Mine Reclamation Act

The purpose of MMRA is to provide that the usefulness, productivity, and scenic values of mined land receive "the greatest reasonable degree of protection and reclamation to beneficial use." It also recognizes that the degree of reclamation is controlled by its practicability. MMRA requires the establishment, on a continuing basis, of vegetative cover, soil stability, water conditions, and safety conditions appropriate to the proposed post-mining land use.

At the Mineral Hill Mine, the post-mining land use will be wildlife habitat, recreation, hunting, logging and water quality protection. Reclamation will support this land use to a reasonable degree as required by MMRA.

Reclamation of the mine site will likely be completed by the end of 2001. This will comply with the requirement to reclaim within 2 years after abandonment.

TVX may not depart from the approved reclamation plan without first obtaining written approval of the proposed change from DEQ.

Collecting and treating any seepage that might develop from the TSF will protect groundwater quality. The proposed biological treatment system has redundant components to reduce down time. Contingency plans will protect groundwater quality during wet years.

The TSF has been regraded to slopes less than 4:1. The TSF will be covered with 36 inches of alluvial borrow material subsoil and 12 inches of soil to form an approximate water balance cap.

The reclaimed vegetation will be a combination of Douglas fir, shrubs, grasses, and forbs. This community will have a general appearance similar to the surrounding natural vegetation and will help control erosion and reduce seepage through the TSF. There will be no sanitary landfill on the site.

Noxious weeds will be controlled until DEQ decides that revegetation has been successful, and the bond is released.

MMRA requires that the reclamation plan provide sufficient measures to prevent the pollution of air and water. TVX's compliance with the Montana Water Quality Act, the Montana Pollutant Discharge Elimination System, and the Clean Air Act of Montana is described below.

### Montana Water Quality Act

Any seepage through the TSF will be collected and treated. A reverse osmosis system will be used until the proposed biological treatment system is proven to be effective. The partially treated seepage would be utilized in the wetland and upland habitat development sites. The Mineral Hill Mine is expected to comply with the Water Quality Act after closure.

The 1300 Adit discharge would be treated using coprecipitation with iron and would meet groundwater standards before it is discharged from the dosing tank to the existing septic tank drainfield system.

Crevice Adit water meets all Bear Creek water quality standards.

### Montana Pollutant Discharge Elimination System

TVX's Storm Water Pollution Prevention Plan (SWPPP) was approved under General Discharge Permit for Storm Water Authorization MTR300232. TVX also holds Authorization to Discharge under the Montana Pollutant Discharge Elimination System (MPDES) MT-0030252. Discharge of TSF seepage water to Bear Creek will be eliminated. The MPDES permit discussed the need to include a new discharge outfall to an ephemeral tributary of Bear Creek as a contingency in case the biological treatment system needs repair or maintenance. Discharge under the contingency plan would comply with water quality standards.

### Clean Air Act of Montana

TVX holds Air Quality Permit #2087-06.

### Montana Hard Rock Impact Act

The Hard Rock Impact Mitigation Plan for the Mineral Hill Mine was issued on October 15, 1984.

### Montana Environmental Policy Act (MEPA) Cumulative Effects Assessment

**Chapter 3** of the Draft EIS provides cumulative effects analyses. There are no related future actions under concurrent consideration that, when considered in conjunction with past and present actions, are likely to result in additional significant impacts. Should future actions be proposed which have or may have cumulative effects, additional analysis pursuant to applicable requirements of MEPA would be conducted.

## Private Property Assessment Act

The stipulations described above that will be imposed in implementing the **Agency Modified Plan** alternative are needed to meet the requirements of law and, therefore, do not have taking or damaging implications.

### **VII. Monitoring and Compliance**

This section summarizes the project monitoring that will be conducted. The purpose of monitoring is to ensure compliance with the terms and conditions of the approved mining and reclamation plans, to detect problems early, and to provide a basis for directing remediation of unanticipated problems.

#### **A. Agency Monitoring**

DEQ staff will conduct compliance inspections at least twice a year under the authority of MMRA. These inspections will be comprehensive mine-wide inspections. The inspections will consist of examination of disturbed areas, periodic verification sampling at water quality monitoring points, and geochemical sampling of construction materials and reclamation materials. Revegetation will be examined annually based on recommendations from the revegetation specialist hired by TVX. More frequent inspections could be conducted during periods of intense activity, or if compliance problems have been noted and corrective measures are being implemented. Additional inspections for compliance with the Water Quality Act or the Clean Air Act may also be conducted. The results of these inspections will be available in DEQ's files.

#### **B. Operator Monitoring Reports**

The following monitoring reports are required from TVX under the selected alternative. All reports will be submitted to DEQ and will be available in DEQ's files.

##### Annual Water Resources Monitoring Report

This report is submitted yearly and includes the results of all water resources monitoring specified in the Consolidated Closure Plan, **Agency Modified Plan**, and MPDES permit for the entire year. This report also includes a summary of past annual monitoring results and trend analysis. The selected alternative adds to this reporting requirement the monitoring of six additional hydrologic monitoring points (before and after the 1300 Adit chemical addition building and in the dosing tank before discharge to the drainfield); after the upland HDS mix box; after TSF seepage and Crevice Adit water overflows to the wet meadow HDS; and the spring in the Old Tailings North area).

## Annual Operating and Reclamation Status Report

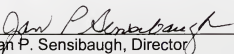
This is the annual report required by MMRA. The annual report describes overall mining and reclamation status. This report includes TVX's tracking of the status and progress in complying with the agency-imposed stipulations until they are incorporated into the Consolidated Closure Plan and approved by DEQ.

### **VIII. Appeals Process**

Under Montana State law, this decision is subject to court appeal by the applicant and other parties for 90 days after issuance of the operating permit amendment. Notice of permit issuance will be published in the Bozeman Daily Chronicle and Livingston Enterprise newspapers.

### **IX. Approval**

This Record of Decision is effective upon signing by the department director.

  
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Jan P. Sensibaugh, Director  
Montana Department of Environmental Quality

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Date

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**APPENDIX H**  
**BOND SUMMARY**  
**AND**  
**PUBLIC COMMENTS AND RESPONSES**  
**ON**  
**TVX CONSOLIDATED CLOSURE PLAN BOND RELEASE**

**Table H-1. Final Bond Summary Sheet**

Direct Costs:			
<i>Item # 1</i>	Facilities		\$ 737,000.00
<i>Item # 2</i>	Tailings Storage Facility		\$ 341,000.00
<i>Item # 3</i>	Old Tailings South		\$ 6,160.00
<i>Item # 4</i>	Roads		\$ 226,000.00
<i>Item # 5</i>	Underground Openings		\$ 50,000.00
<i>Item # 6</i>	Development Rock Piles		\$ 459,000.00
<i>Item # 7</i>	Miscellaneous		\$ 90,000.00
<i>Item # 8</i>	Interim Maintenance and Shutdown		\$ 2,500.00
<i>Item # 9</i>	Site Management During Reclamation		\$ 550,000.00
	Subtotal		\$2,461,660.00
Indirect Costs:			
	Contingencies	5%	\$ 123,083.00
	Mobilization	5%	\$ 123,083.00
	Engineering Design	5%	\$ 123,083.00
	Agency Administration	5%	\$ 123,083.00
	Inflation (3%over 5 years)	16%	\$ 393,865.60
	Grand Total		\$3,347,857.60
	<b>Reclamation Bond</b>		<b>\$3,348,000.00</b>
<i>Item # 10</i>	<b>Water Treatment Bond</b>		<b>\$5,189,000.00</b>
	<b>TOTAL</b>		<b>\$8,537,000.00</b>

**PUBLIC COMMENTS AND RESPONSES  
ON  
TVX CONSOLIDATED CLOSURE PLAN BOND RELEASE**

**Gardiner, MT Comfort Inn  
APRIL 26, 2001**

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**Part I. Notes from the Informal Open House**

1. If something happens to TVX (bankruptcy) will the letter of credit still be in effect?  
(Mary Hektner)

**Response:** Yes. DEQ would notify the Royal Bank and cash in the letter of credit. It would be deposited in the State Board of Investments. DEQ would proceed with reclamation.

2. Has there been a discussion of a time frame for the transfer of property?  
Does this affect the reclamation work? (Mary Hektner)

**Response:** The property transfer negotiations continue. The property would not be transferred until TVX completed its reclamation obligations. The reclamation work would commence as soon as the Record of Decision is signed. The Final EIS Responses to Public Comments section contains more information on the land transfer agreement.

3. If the Forest Service accepts the donated land – does TVX get credit on the bond?  
Is the Forest Service responsible for the reclamation and water quality monitoring of the donated land? (Mary Hektner)

**Response:** Yes. DEQ would release the TVX bond. In exchange for the valuable property, the Forest Service would be responsible for the maintenance of the reclamation and water treatment including water quality monitoring on the site.

4. Has there been much success with the current revegetation? (DEIS)  
(Mary Hektner)

**Response:** Yes. There has been limited reclamation until 2000. The old reclamation looks good, but no bond has been released to date. The reclamation in 2000 was seeded last fall, so this will be the first growing season.

5. Did TVX do any supplemental irrigation? (Mary Hektner)

**Response:** Yes. TVX did some supplemental irrigation in the Old Tailings North area using Crevise Adit water.

6. Questions regarding the wells – Have they been shut down/dried up? What water is used for irrigation? **(Mary Hektner)**

**Response:** The wells continue to function and won't be closed until they are no longer needed. Crevice Adit water was used for irrigation of the Old Tailings North area.

7. What is the use of the water that comes out of the Crevice? Water Rights Questions, also. **(Mary Hektner)**

**Response:** The majority of the water is discharged to Bear Creek as it meets all water quality standards. Up to 50 gpm are used for the Jardine area fire suppression system. TVX has copied YNP with water rights information.

8. Has there been any temporary use of water? How will this effect the town's wells?

**Response:** There has been no temporary use of well water or the Crevice Adit water that reports to the Jardine fire suppression system. There will be no effect on area wells.

9. Can I get a copy of the Water Rights Evaluation? **(Mary Hektner)**

**Response:** TVX forwarded a copy to YNP on April 27, 2001.

10. Is the tailings storage facility fenced? **(Mary Hektner)**

**Response:** Yes. But the agencies are going to stipulate in the Record of Decision that the fence be maintained until the revegetation monitoring shows the trees and woody plants have established.

11. Patrick Plantenberg and Mary Hektner had a discussion on what type of nitrogen fixer legumes would be least offensive to YNP.

**Response:** Mary was to check with YNP and get back to DEQ or TVX.

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## **Part II. Notes from the Formal Public Hearing, Bond Release Questions, April 26, 2001**

### **1. MILL CLEAN UP:**

- A. Does the mill cleanup meet the requirements of the regulatory agencies? **(Mary Hektner)**

**Response:** Yes. Materials that did not pass toxicity sampling protocols were shipped to a licensed disposal site. Other materials were shipped to the Park County landfill.

B. Who did the work? (Don Bachman)

**Response:** TVX employees.

2. PROCESS POND RECLAMATION: No questions

3. TSF AREA RECLAMATION: (Toe berm extended, liner installed, Quality Assurance/Quality Control procedures) No questions

4. POST-MINE TOPOGRAPHY: (TSF contours, grading and compaction)

A. What is the permeability? (David Chambers)

**Response:** All of the hundreds of samples met the compaction specifications which were 95% Modified Proctor. This is a standard compaction test used to determine the density achieved.

5. TAILINGS WORK – 18" SOIL COVER: No questions

6. OLD TAILINGS SOUTH (OTS) AREA RECLAMATION:

A. What does it mean when you say the soil was removed until the arsenic in the soil was less than 100 parts per million (ppm) total? (Mary Hektner)

**Response:** Parts per million is an expression of chemical concentration. Ppm is defined on the basis of mass. It is frequently used to express very small amounts of one substance (a solute) in the presence of almost 100% of another (the solvent). Parts per million is equivalent to milligrams per liter (mg/L).

The 100 ppm arsenic criterion was based on soil cleanup recommendations followed by CERCLA. CERCLA (Superfund) establishes arsenic soil cleanup level guidelines for residential and industrial sites. The cleanup criteria are based on a human health risk base and phytotoxicity to plants. For example, in the Anaconda area, arsenic cleanup levels by these guidelines are 400 ppm for industrial sites and 250 ppm for residential sites. These cleanup levels can vary according to site characteristics. There are cases where 30 ppm is necessary in order to encourage plant growth. A level of 100 ppm is considered conservative for soil that is expected to be used as a growth material. The OTS area has been covered over with clean borrow material after removal of tailings and contaminated soils to the 100 ppm concentration arsenic level.

**B. How was it tested? (David Chambers)**

**Response:** The standard test method used for soil analysis under Superfund guidelines is EPA 3050A for total metals. OTS area samples were sent to Energy Labs in Billings.

**C. Question regarding the boggy/wet area at the OTS on the slide (Julia Page).**

**Response:** Frank Bergstrom explained TVX put in a negative grade to create a boggy area to plant willows, etc in the area.

**D. Question regarding the drainage in the boggy/wet area (David Chambers)**

**Response:** TVX has constructed a drainage channel through the area. Details can be found in the Consolidated Closure Plan.

**7. ROADS: (Credit for 8400 feet of road reclaimed in 2000):**

**A. How much is being set-aside for revegetation, weeds, erosion etc?**

**Response:** \$1500 per acre is proposed to be released for the recontouring, dirt work and seeding. \$1000/acre would be held for revegetation, etc.

**B. If the \$1000/acre is used up – what then? (Mary Hektner)**

**Response:** That is all the money available unless additional funding is sought through grants, legislation, etc.

**C. What is the dirt work credit amount? (Mary Hektner)**

**Response:** \$1500/acre.

**8. UNDERGROUND OPENINGS AND DEVELOPED ROCK PILES:**

**A. What is a laydown area? (Mary Hektner)**

**Response:** A laydown area can be any area used to store equipment during construction or operations. It could also be a staging area.

**9. FIRST CHANCE PORTAL: (Patty Morris – owner)**

**A. Have bats been seen in the area? (Mary Hektner)**

**Response:** Bats have not been documented in the mine area but they are in the Gardiner area.



**10. UNDERGROUND BACKFILL:** No questions

**11. VENT RAISES: (Levels- 500, 750, Top of Hill & First Chance Old Raise)**

A. Questions regarding ventilation in the shaft once it is filled in (**Mary Hektner and Julia Page**).

**Response:** There would still be limited ventilation because some of the openings would remain open.

B. Once the shaft is closed is there a problem with gas, pressure building up?

**Response:** No. The Mineral Hill Mine has never experienced any problem with gases of any kind. It is not like a coal mine.

C. When the shaft is being filled in, do they completely fill the shaft?

**Response:** The vertical raises are filled with waste rock part of the way and then a concrete platform is poured. Then the rest of the shaft is filled with waste rock and the top is soiled and seeded.

**12. REVEGETATION:**

A. What nursery provided the vegetation?

**Response:** Two nurseries have been used to date. One is located in Idaho and the other one is in Corvallis, MT.

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**Part III. Notes from the General Discussion/Bond Release Questions  
Following the Formal Public Hearing April 26, 2001**

1. Questions on the draft bond amount and the credit amount? (**Mary Hektner**)

**Response:** The final draft bond amount is \$8,469,000. The entire bond was recalculated, so DEQ did not calculate the credit amount.

2. What reclamation is left besides revegetation? (**Mary Hektner**)

**Response:** There are still roads to reclaim, the mill area, the tailings storage facilities, and miscellaneous development rock piles. In addition, the water treatment facilities need to be constructed. TVX believes they can complete the work in 2001.

3. George Nell requested a vegetation search of the area.

**Response:** TVX will coordinate a trip for the locals in late May or early June to look for bitterroot plants.

4. Is there a public access road within the donated land? **(David Chambers)**

**Response:** Yes.

5. Is the Crevice Adit Water gravity fed? Can the town tap into it?

**Response:** Yes. The Jardine residents must organize into a public water supply governing body. Residents who wish to tap into the water supply would have to negotiate with the governing body to hook up to the system.

6. Julia Page asked Frank Bergstrom to track the "Jardine Road" on the map.

**Response:** TVX showed the road on a map at the hearing.

7. What is the criterion for successful revegetation? **(David Chambers)**

**Response:** DEQ will evaluate the recommendations of the revegetation specialist that TVX has hired to set up a monitoring plan. The minimum requirements in the Metal Mine Reclamation Act include phrases like "comparable stability and utility". DEQ would need to ensure that Douglas fir and other woody plants survive and thrive on the tailings storage facility. DEQ would probably use comparisons with native reference areas in the mine area.

8. Are there fences around the Tailings Storage Facility area? **(Julia Page)**

**Response:** Yes. DEQ will stipulate that the fence be maintained around the TSF to prevent wildlife depredation of the tree and shrub seedlings.

9. Seed source? **(Mary Hektner)**

**Response:** The grass and forb seeds are purchased from Montana suppliers but the seed may have been grown anywhere in the northwestern United States. Douglas fir seedlings were purchased from a nursery with a seed source from a similar area in Montana. The tree and shrub seeds for the 2001 plantings were collected on site.

10. Will the bond release be in phases as reclamation is done or all at one time?  
**(Dan Bachman)**

**Response:** The decision to request a bond release is up to the mining company. They can request as much as they want as often as they want.

11. How many years before bond release on the revegetation? (**Dan Bachman**)

**Response:** DEQ would consider the recommendations of the revegetation specialist hired by TVX, but DEQ would need a fairly long time to decide if trees and shrubs will establish and persist on the TSF as planned. DEQ expects it would take at least 5 years, and probably 10 years would be a more reasonable length of time.

12. Instrumentation for weather climate in revegetation areas? (**Dan Bachman**)

**Response:** DEQ did not require TVX to monitor climate information as part of the bond. TVX has a weather station onsite that they would donate to the USFS if they take over the site.

13. Has DEQ checked for potential contamination from oil spills? Has DEQ taken samples from around the mill site to check for contamination? (**Mary Hektner**)

**Response:** TVX has written a letter to DEQ on April 20, 2001 committing to sample the mill area soils to ensure there is no contamination around the mill area. If the materials are contaminated they will be removed from the site or buried at least four feet deep on the site.

14. Who is coordinating the transfer of property from TVX to FS? Who is in charge of the transfer? (**Richard Parks**)

**Response:** DEQ has been working with Mike Burnside. DEQ called Mike Burnside of the USFS Region 1 office in Missoula and informed him of the Bear Creek Council concerns. DEQ informed the USFS that the Bear Creek Council wants to meet with the Forest Service.

15. What form is the bond in?

**Response:** The bond is a letter of credit. A letter of credit is a more liquid financial instrument than a surety bond from an insurance company.

16. Questions about the discount rate in the bond. (**David Chambers**)

**Response:** DEQ had Peter Werner, DEQ Engineer review Mr. Chambers' concerns. A meeting with DEQ management will be scheduled to consider a change in the bond procedures manual being used by DEQ.

17. Is the biological activity being monitored? Is it being monitored during the winter?

**Response:** DEQ will take the recommendations of the revegetation specialist. If he feels the biological activity needs to be monitored, DEQ will ask for the monitoring.

18. When is the sampling being done? (Mary Hektner)

**Response:** See the above response.

19. The public would like an inspection in October to see the reclamation activity at the mine.

**Response:** TVX and DEQ will schedule a tour of the reclamation in late fall.

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#### **Part IV. Comment Letter from Center for Science in Public Participation on Bond Release**

##### **1. Calculation of Bond Amounts using Net Present Value (NPV)**

While using NPV to set bond amounts, especially for long term water treatment, gives the public proper financial protection while minimizing the short term surety that an operator must put in place, using NPV to calculate a surety amount must take a conservative approach in minimizing the long term financial risk to the public. In the bigger picture, the approach that will minimize the long-term risk to the public is to have as large as possible an amount of money on-hand to address any needs and problems that may arise. The best approach would probably be to require the entire amount needed up front, and then return the interest on this money to the operator as funds accrue in excess of the amount required for the required tasks.

The disadvantage is that this approach requires the operator to put up a large amount of money in the near-term, an amount which in many cases would prohibit the profitable operation of the mine.

The proposed bond for Mineral Hill uses an NPV approach, but stops calculating the long-term incremental contributions to the cost after 100 years. I have attached an MSExcel spreadsheet that shows the effect of carrying the cost calculation out another 100 years (200 years total) into the future. This adds approximately 5% (\$239,000) to the amount of the bond. While being short this amount does not place the state at a huge additional risk in relation to the amount presently proposed, it still raises the issue of why the state should assume this additional 5% risk, as opposed to the mine operator.

In using an NPV calculation, the calculation [should] be carried to a point in time where each additional time increment adds an insignificant amount to the calculated bond amount. I suggest this might be when the total contribution of the remaining amount is less than 1% of the total amount.

In the case of Mineral Hill, a 5% under-calculation is not in the best interest of the public.

**Response:** DEQ thanks you for your comments. You make some very good points that DEQ would like to follow up on. DEQ revised its Bond Procedures Manual in 2000. In that 2000 update, DEQ increased the bond term to 100 years if needed. The method you propose may be more desirable and protect the public as you state. DEQ would like to propose that the Environmental Management Bureau staff meet with the Center for Science in Public Participation staff and discuss this method with DEQ management. DEQ management would make the final decision. Please contact Patrick Plantenberg at 406-444-4960 to set up a meeting.

## **2. Sensitivity of the Discount and Interest Rates used for the Calculation**

I have also included in the attached spreadsheet an example of how assuming the difference between the discount rate and the interest rate can significantly affect the amount of money required in the long-term to complete the bonded tasks.

The spreadsheet shows that if a 2% difference is assumed between the discount rate and the interest rate, instead of the 3% used in DEQ's calculation, the total bond required jumps from \$5,189,000 to \$6,755,000 – a 30% increase in the amount required.

I can't argue that DEQ should assume a 2% split, or some other amount other than 3%, but would like to point out that the assumptions of the discount rate and interest rates are very critical in determining the amount that will be required to carry out the bonded tasks. If the state makes a wrong assumption here, there could be a considerable shortfall in the amount of money to carry out the required tasks.

*DEQ should make very conservative assumptions about the discount rate and interest rates (especially the difference between these) at the risk of significantly underestimating the amount required in the long-term to complete the tasks scheduled to be funded by the bond.*

**Response:** DEQ thanks you for your comments. You make some very good points that DEQ would like to follow up on. DEQ revised its Bond Procedures Manual in 2000. In that 2000 update, DEQ decided on a method for determining Net Present Value and the interest and discount rates. DEQ is also concerned about this potential risk. DEQ would like to propose that the Environmental Management Bureau staff meet with the Center for Science in Public Participation staff and discuss this potential risk with DEQ management. DEQ management would make the final decision. Please contact Patrick Plantenberg at 406-444-4960 to set up a meeting.







Montana Department of  
**ENVIRONMENTAL QUALITY**

Judy H. Martz, Governor

P.O. Box 200901 • Helena, MT 59620-0901 • (406) 444-2544 • [www.deq.state.mt.us](http://www.deq.state.mt.us)

April 25, 2001

Dear Reader:

Enclosed is a Final Environmental Impact Statement (EIS) for the TVX Mineral Hill Mine Consolidated Closure Plan (CCP) proposed by TVX Mineral Hill, Inc. The Montana Department of Environmental Quality (DEQ) is adopting the Draft EIS for the TVX Mineral Hill Mine Consolidated Closure Plan as the Final EIS, as allowed under the Rules Implementing the Montana Environmental Policy Act (MEPA)(ARM 17.4.618).

The following **Appendix E, Errata and Supplementary Information** is the result of changes necessary to respond to public comments and agency review of the Draft EIS for the proposed TVX Mineral Hill Mine Consolidated Closure Plan. These changes are presented in this manner because of the relatively small number of changes. The bulk of the changes incorporate additional information about water monitoring, water treatment, bond and revegetation. None of the information substantially changed the analysis. As a result, DEQ has selected the Agency Modified Plan as the preferred alternative.

**Appendix F, Public Comments and Responses**, contains a compilation of the comments received during the public comment period on the Draft EIS, the Draft MPDES permit and DEQ's responses to those comments.

**Appendix G, Responses to MPDES Comments Cover Letter, Final MPDES Permit and Fact Sheet**, is attached at the end of the Final EIS.

Once a decision has been made by the Director of DEQ, a Record of Decision will be sent to everyone on the Final EIS mailing list. The DEQ would like to thank everyone who participated in the EIS process. It is only with the active participation of all parties that the MEPA process works properly and ultimately results in the best documents and decisions.

Sincerely,

Jan P. Sensibaugh  
Director

Enclosure  
JN

FINAL ENVIRONMENTAL IMPACT STATEMENT  
AMENDING AND ADOPTING THE  
DRAFT ENVIRONMENTAL IMPACT STATEMENT  
TVX MINERAL HILL MINE  
CONSOLIDATED CLOSURE PLAN  
APRIL 2001

The Montana Department of Environmental Quality (DEQ) is adopting the Draft Environmental Impact Statement (EIS) for the proposed TVX Mineral Hill Mine Consolidated Closure Plan as the Final EIS as allowed under the rules and regulations implementing the Montana Environmental Policy Act (ARM 17.4.618). The following **Appendix E, Errata and Supplementary Information**, is the result of changes necessary to respond to public comments on, and agency review of, the Draft EIS for the proposed TVX Consolidated Closure Plan. These changes are presented in this manner because of the relatively small number of changes. The bulk of the changes incorporate additional information about water monitoring, water treatment, bond and revegetation. None of the information substantially changed the analysis. As a result, DEQ has selected the Agency Modified Plan as the preferred alternative.

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Copies of the Final EIS can be obtained from:

Patrick Plantenberg  
Montana Department of Environmental Quality  
P. O. Box 200901  
Helena, MT 59620-0901  
Phone: (406) 444-4960 or e-mail [pplantenberg@state.mt.us](mailto:pplantenberg@state.mt.us)

Copies of the Final EIS can be viewed at the following locations:

Montana Department of Environmental Quality offices in Helena, MT  
The DEQ Web site: <http://www.deq.state.mt.us>  
Gardiner Public Library in Gardiner, MT  
US Forest Service, Gardiner Ranger District in Gardiner, MT  
Montana State Library, Helena, MT

## APPENDIX E

### TVX MINERAL HILL MINE CONSOLIDATED CLOSURE PLAN

#### FINAL ENVIRONMENTAL IMPACT STATEMENT

#### ERRATA AND SUPPLEMENTARY INFORMATION

The Draft EIS is adopted as the Final EIS with the following changes:

**Table of Contents:** Add after **Appendix D: "Appendix E, Errata and Supplementary Information."** Add after **Appendix E: Appendix E-1, 1999 Water Monitoring Resources Report for the Old Tailings North Site. Mineral Hill Mine, Park County Montana."** Add after **Appendix E-1: "Appendix F, Public Comments and Responses to Closure Plan Alternatives and Draft MPDES Permit."** Add after **Appendix F: "Appendix G, Responses to MPDES Comments Cover Letter, Final MPDES Permit and Fact Sheet."**

**Page 2, Agencies' Roles and Responsibilities,** insert at the end of the first paragraph: "DEQ must assume there is no guarantee that the lands would be transferred to the USFS. The DEIS analyzed the impacts of the reclamation plan as if TVX would be the ultimate owner and the draft bond was calculated accordingly."

**Page 9, TSF Seepage Management,** add new paragraph to the end of the section: "The Consolidated Closure Plan in sub-appendices to Appendix 8 cites a limited number of other locations where the biological treatment system chemistry proposed at TVX for the TSF has been tested: (1) Shepherd Miller, Inc. 2000. "Treatment and Disposal of Mineral Hill Mine Tailings Storage Facility Effluent". Technical Memorandum SMI3100639. October 4, 2000, 2 pages plus attached 11-page report with Tables and Figures and 2) Knight Piesold 1999. "TVX Mineral Hill Mine Site Treatment of Tailings Storage Facility Underliner Effluent Conceptual Passive Treatment System Design and Basis". 11-page letter and attached Tables and Figures)."

**Page 20, Seepage Quality,** insert new paragraph between the eleventh and twelfth paragraphs: "DEQ does not anticipate ice accumulation problems in the wet meadow HDS. If, in a wet year, the flow did freeze and could not be pumped to the upland HDS for disposal, the 0.5-acre, 8-foot deep, triple-lined, wet meadow HDS would hold the total flow for the entire winter, which could then be treated by the wet meadow and upland HDS systems in the following spring and summer."

**Page 23, Applicant's Proposed Plan, insert additional paragraphs at the end of the third paragraph on the page:** "TVX has offered the Crevice Adit water as a source for a public water supply and fire suppression system for the residents of the Jardine Historic District. TVX has proposed to construct a new groundwater source, potable water supply for the Jardine Historic District (p. 10, Applicant's Proposed Plan). The system design would have to be approved by DEQ. To make use of that source, the residents would have to organize into a Public Water Supply System (PWSS) entity that could operate and maintain the system in accordance with State of Montana requirements. TVX has not offered to operate and maintain the public water supply for the benefit of Jardine residents.

Should the property remain in the hands of TVX, bond would be retained for maintenance activities and to cover the cost of one part-time employee. TVX would be responsible for maintaining compliance with its operating and MPDES permits. The PWSS entity would be responsible for maintaining compliance with the PWSS permit.

If DEQ assumes the operating permit in the event of a TVX bankruptcy, DEQ would be responsible to ensure that bond would be held for professional services, engineering design and management, and for the part-time employee. DEQ would maintain the operating and MPDES permits.

The PWSS governing body would have to ensure the presence of a certified operator."

**Page 25, Agency Modified Plan, insert new paragraphs at end of the section:** "Only arsenic exceeds a groundwater criterion in the 1300 Adit discharge (CCP, Appendix C, p. C-FS-9). Once treated by ferric sulfate (iron) addition, the resulting sludge volume would be small as determined by bench and pilot scale testing. DEQ does not anticipate a change in the schedule for septic tank sludge pumping over what it would be without 1300 Adit water addition. The sludge from the iron coprecipitation process and sewage would be co-mingled. The 1300 treatment sludge would be an iron-arsenic oxyhydroxide. The cumulative septic/treatment sludge would be pumped by standard septic tanker truck and managed the same as other septic tank sludge in the Park County area. The mill process sludge passes the Toxic Contaminant Leaching Procedure (TCLP) test (see Table E-3 in **Appendix E**).

The existing drainfields were designed for 200 people. The current use is much less. DEQ believes that the existing drainfields could handle the increase in flow by 15 gpm without any problem. The frequency of pumping would depend on the amount of use by the local residents. Currently the system is pumped once per year. DEQ would add the spring above the OTN as a monitoring point to ensure the drainfield capacity is not exceeded."

**Page 29, Agency Modified Plan, insert new last paragraph of section:** "TVX must submit a revised detailed monitoring and maintenance plan to update the CCP to accurately reflect the changes made in the Applicant's Proposed Plan by the Agency Modified Plan in this EIS. The plan would be due to DEQ by the end of 2001."

**Page 30, Existing Plan, insert new paragraphs after the fourth paragraph:** "As long as an operating permit is in place for the mine site, TVX could propose a land use change to residential subdivision or commercial development for all or part of the property and DEQ would have to analyze the environmental impacts of that land use change. The Metal Mine Reclamation Act (MMRA) does not preclude the potential use of a mine site for subdivisions or commercial development."

Once the reclamation bond is released on an operating permit, the landowner can do anything he wants with the private property, including subdivision or commercial development, as long as the landowner complies with other State of Montana regulations."

**Page 31, Applicant's Proposed Plan, insert an additional sentence at the end of the section:** "The laws under which the land would be donated to the USFS would preclude claim staking and mining under the 1872 mining law."

**Page 39, Agency Modified Plan, add a new sentence at the end of the first paragraph:** "DEQ would have the revegetation specialist make native species recommendations and would ensure that TVX plants Douglas fir and other species of woody plants from local collections."

**Page 39, Agency Modified Plan, add a new paragraph at the end of the section:** "DEQ believes the minimum revegetation monitoring period for revegetation communities dominated by woody plants would be at least 5 years. Noxious weed monitoring would also continue for the same period."

**Page 40, Issue 11. Bond, insert the following language at the end of the second last paragraph of the section:** "DEQ utilizes a conservative real discount factor in the calculation of the net present value (NPV) of future payments over a 100-year period (p. 10 of the Water Treatment Bond detailed calculations). The operation, maintenance, capital and replacement costs were also estimated based on a 100-year economic model. Less than 0.3 percent of the inflated costs must be invested today to pay bills 100 years from now at an interest rate of 6 percent. DEQ assumed a 3 percent inflation rate and 6 percent interest or discount rate based on current economic conditions. The NPV calculation uses a real discount factor (interest minus inflation) of 3 percent. This is very conservative because the State of Montana bond funds have consistently achieved a real growth rate of 3 to 4 percent, and the state pension fund has achieved a 6 percent real growth rate. Therefore, use of a 3 percent real growth rate offers the state a significant upside potential in terms of revenue generated from unplanned

interest. It is not possible to justify a lower real discount rate, and therefore the state could not responsibly use a more conservative number."

**Page 40, Issue 11. Bond, insert the following sentences at the end of the existing last paragraph:** "See the final draft bond calculations in Table E-1 in **Appendix E**. The final bond calculation for the preferred alternative would be in the Record of Decision."

**Page 40, Issue 11. Bond, insert a new paragraph at the end of the section:** "If needed, DEQ could add more bond at any time the Operating Permit is in place, through implementation of the MMRA section 82-4-337 (2). This section allows DEQ to modify the reclamation plan at any time if needed to comply with the regulations."

**Page 41, Existing Plan: tenth paragraph on the page:** The reclamation bond cost of "4.478,000" should be corrected to "4,478,000".

**Page 43, Applicant's Proposed Plan, insert new paragraph after the fifth paragraph:** "Normally, before a bond can be released, any affected party can request a contested case hearing under the Montana Administrative Procedure Act. However, DEQ believes if the land transfer to the USFS is approved, then DEQ would administratively have no choice but to release the bond back to TVX."

**Page 44, Agency Modified Plan, insert new paragraphs at the end of the section:** "The bonds are currently all irrevocable letters of credit. DEQ accepts surety bonds as well. Any bond posted must be approved by the DEQ."

DEQ may cause forfeiture of a letter of credit under two circumstances. First, payment may be sought following DEQ's notification of an operator of a failure to complete reclamation in accordance with the MMRA, Section 82-4-341(2), MCA, or to complete reclamation in accordance with its approved reclamation plan within 2 years after completion or abandonment of its operation. Second, payment may be sought in the event the bank elects not to renew the letter of credit and the operator fails to submit replacement bond.

DEQ receives payment upon sending certification to the bank of the existence of one of these circumstances. The bank has no standing to challenge the basis for the forfeiture of the letter of credit. If payment is not received within 30 days, DEQ may commence an action in district court.

The permittee may challenge DEQ's forfeiture of the letter of credit in a contested case hearing under the Montana Administrative Procedure Act. DEQ would prevail in that forum upon establishing the factual basis for the forfeiture by a preponderance of evidence."



**Page 51, The Public Involvement and Scoping Process, first paragraph:** Date in line 7 changed from "march 1, 2000" to "March 15, 2000."

## **TABLES**

New **"Table E-1: Final Draft Reclamation Bond Summary for Agency Modified Plan"**, add to **Appendix E** (see attached Table E-1).

New **"Table E-2: OTS Lysimeter Water Quality Analysis"**, add to **Appendix E** (see attached Table E-2).

New **"Table E-3: TCLP Analysis of the Mill Process Sludge"**, (see attached Table E-3).

New **"Table E-4: Results of Bench-scale Tests of the 4-Stage Biological Treatment System Operated for 188 Days"**, (see attached Table E-4).

New **"Table E-5: Crevice Adit Water Quality"**, (see attached Table E-5).

## **APPENDIX A, ISSUE DISPOSITION SUMMARY**

**Page A-9, Issue 6. Reclamation Schedule, Issue Discussion, add new language to second paragraph: Delete the fourth sentence and replace with:** "The Metal Mine Reclamation Act requires reclamation to be completed within 2 years after completion or abandonment of a mine site disturbance (82-4-336(3) and 341(4)(b), MCA). Mining stopped in 1996."

**Then add new language after the existing last sentence of paragraph two:** "TVX then tried to sell the property. Then TVX submitted a request for an amendment. If the Consolidated Closure Plan had not been submitted by TVX, reclamation should have been completed by now. The review and analysis process for the Consolidated Closure Plan has delayed the implementation of the 2-year clock. DEQ believes the 2-year timeframe for reclamation work to be completed starts when the Final EIS is approved. TVX would have 2 years to complete the reclamation work and construction of the water treatment facilities. TVX has told DEQ that they believe they can complete all of the reclamation work and water treatment system construction in 2001. Of course, extensions could be granted if unforeseen situations develop like the fire closures in 2000."



## APPENDIX C, DRAFT MPDES PERMIT

The following are changes were made to the Draft MPDES as a result of public comments. The Final MPDES permit is attached as **Appendix G**.

**MPDES Permit, Part I, Section D, Self-Monitoring Requirements, Outfall 005B, replace the paragraph with the following:** "Monthly sampling of the chemical addition building effluent would provide data on treatment efficiency (CCP p. C-FS-12, Appendix C). Annual sampling of the dosing tank overflow was intended as a QA measure only (CCP p. C-FS-9 and C-FS-12, Appendix C). DEQ would add quarterly monitoring of the dosing tank." A new Table 9 has been added to the Final MPDES permit (see **Appendix G**):

### Outfall 005B:

TABLE 9. EFFLUENT MONITORING REQUIREMENTS		
Parameter	Frequency	Type <sup>(1)</sup>
Effluent Flow Rate, gpm	Quarterly	Instantaneous
Dissolved Arsenic, mg/L	Quarterly	Grab
Total Recoverable, Arsenic, mg/L	Quarterly	Grab
<sup>(1)</sup> See the definitions in Part I.A. of the permit.		

**MPDES Permit Notification of Contingency Plans:** The following text has been added to the Final MPDES Permit: "If one of the contingency plans, described in the Fact Sheet, for discharge is anticipated, the Water Protection Bureau must be notified prior to implementation." See **Appendix G**.

**MPDES Fact Sheet, Section J, Contingency Plans:** The following language has been added to the Final MPDES Permit: "If a discharge is anticipated through Outfall 006 the applicable standard, nondegradation standard, or background conditions would have to be met. Nondegradation would apply only to that portion of the discharge, which was not in existence prior to April 29, 1993, or is considered exempt. The MPDES Fact Sheet has been modified to reflect this condition. The permittee will be required to inform the department if the upland HDS or other contingency plans are to be used." See **Appendix G**.



Montana Department of  
**ENVIRONMENTAL QUALITY**

Judy H. Martz, Governor

P.O. Box 200901 • Helena, MT 59620-0901 • (406) 444-2544 • [www.deq.state.mt.us](http://www.deq.state.mt.us)

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February 13, 2001

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Dear Reader:

Enclosed for your review and comment is the Draft Environmental Impact Statement (EIS) for the TVX Mineral Hill, Inc. (TVX) Mineral Hill Mine Consolidated Closure Plan.

TVX Mineral Hill, Inc. has applied to the Montana Department of Environmental Quality (DEQ) for an amendment to Operating Permit No. 00100 for the Mineral Hill Mine. TVX and its predecessors mined gold from the underground Mineral Hill Mine near Jardine, MT from 1989 to 1996. The proposed amendment is a Consolidated Closure Plan (CCP) to reclaim the mine site and provide plans for long-term water management on the site. The Mineral Hill Mine is on patented land, but TVX proposes to donate the private land to the US Forest Service when the reclamation is completed.

The CCP would result in reclamation of the 69 acres of land disturbed by TVX under Operating Permit 00100 since it was issued in 1986. Reclamation plans call for the revegetation of all surface disturbances except the Bear Creek Road, which would be left as a post-mine access road through the property. Historic disturbances in the mining district that predate the passage of the Metal Mine Reclamation Act in 1971 are not included in the CCP.

The Draft EIS analyzes the potential impacts of the Applicant's Proposed Plan as well as the potential impacts of two alternatives to the proposed amendment: 1) Existing Plan (No Action) and 2) Agency Modified Plan. The Draft EIS addresses issues and concerns raised during public scoping from March through June 2000 at meetings held in Gardiner and by comments received from the public. The operating permit amendment application is available for review at the DEQ offices in Helena, the Gardiner Public Library and the US Forest Service, Gardiner Ranger District in Gardiner, MT.

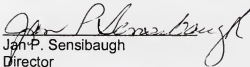
DEQ has selected the Agency Modified Plan as the preliminary preferred alternative. This is **not a final decision**. The preferred alternative could change in response to public comments on the Draft EIS, new information, or new analysis that may be needed in preparing the Final EIS.

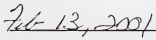
Copies of this EIS can be obtained by writing or calling the Montana Department of Environmental Quality c/o Patrick Plantenberg, P. O. Box 200901, Helena, MT 59620, telephone (406) 444-4960; e-mail address [pplantenberg@state.mt.us](mailto:pplantenberg@state.mt.us). The EIS will also be posted on the DEQ web page: [www.deq.state.mt.us](http://www.deq.state.mt.us).

Public comments concerning the adequacy and accuracy of the Draft EIS will be accepted for 30 days, until March 20, 2001. Written comments may be sent to the Montana Department of Environmental Quality, Environmental Management Bureau, PO Box 200901, Helena MT 59620-0901, attn: Patrick Plantenberg.

An open house and public hearing to receive verbal and written comments will be held in the Gardiner School, Multi-purpose Room, in Gardiner from 6:00 to 9:30 p.m., on March 7<sup>th</sup>, 2001. The open house will be held from 6:00 to 7:00 and from 9:00 to 9:30 pm. DEQ and TVX representatives will be at the open house to answer questions and provide clarification on the DEIS and the CCP. The formal DEQ public hearing will be from 7:00 to 9:00 pm.

Since the Final EIS may only contain public comments and responses, and a list of changes to the Draft EIS, please keep this Draft EIS for future reference.

  
John P. Sensibaugh  
Director

  
Date

# DRAFT ENVIRONMENTAL IMPACT STATEMENT

**PROPOSAL FOR THE  
TVX Mineral Hill Mine**  
*CONSOLIDATED CLOSURE PLAN MODIFICATIONS*  
**NEAR**  
*GARDINER, MONTANA*



*Prepared by:*  
*State of Montana, Department of Environmental Quality*

*February 12, 2001*



# EXECUTIVE SUMMARY

## INTRODUCTION

Amerikanuak, Inc. (AKI), the operator of the Mineral Hill Mine (MHM) for TVX Mineral Hill, Inc. (TVX), of Toronto, Ontario, Canada (hereafter referred to as "applicant") has submitted a Consolidated Closure Plan (CCP) application to the Montana Department of Environmental Quality (DEQ) to amend the TVX Operating Permit 00100 and modify the approved reclamation and water management plans for final mine closure. Approval of the amendment would allow the applicant to update certain elements of the existing reclamation plan to reflect more efficient methods for reclamation of surface disturbances and more effective water quality controls.

During the public scoping process, it was agreed that an Environmental Impact Statement (EIS) pursuant to the Montana Environmental Policy Act (MEPA) would best serve to evaluate environmental effects of the proposed changes and incorporate public comment. The EIS will present a description of the public scoping process to identify issues to be presented in the document (*Appendix A*). In response to scoping comments and following agency review, three action alternatives have been developed; 1) the Existing Plan (the No Action alternative), 2) the Applicant's Proposed Plan, and 3) the Agency Modified Plan.

In addition to considering changes to the approved reclamation and water management plans, the EIS will also serve as the MEPA document for the applicant's revised Montana Pollution Discharge Elimination System Permit (MPDES) No. MT-0030252. TVX has been authorized by DEQ for surface water discharges to Bear Creek and discharges to ground water in the vicinity of the mine. Since the mine was put on care and maintenance status prior to full development in 1996 and now would like to conduct final reclamation, discharge points, discharge volumes and pollutant levels need to be reevaluated. The MPDES permit would be modified and renewed for a 5-year period. The MPDES Public Notice, Fact Sheet and Draft MPDES permit are attached to this document as *Appendix C*.

The Mineral Hill Mine has been in operation since the late 1980's; one amendment and 19 modifications to the original permit have been approved. This EIS is tied to the original EIS written in 1986 and other subsequent environmental reviews which can be consulted regarding approved reclamation plans for areas that will not change.

This *Executive Summary* provides a brief discussion of each chapter in the EIS.

## CHAPTER 1

*Chapter 1* describes the proposed action, purpose of and need for the proposed action and the EIS, agency roles and responsibilities, decisions to be made, and public participation in the process.

The DEQ is the state agency responsible for authorizing the plan of operation and reclamation as well as regulating the MPDES permit system. The U.S. Forest Service, Gallatin National Forest (USFS) is the principal landowner in the vicinity of the mine and is a cooperating agency in preparation of the EIS. The USFS is not making a permit decision associated with this state action.

## CHAPTER 2

Public participation, issue identification, and alternatives are described in *Chapter 2*. Public participation in the scoping process and development of alternatives to the Applicant's Proposed Plan has been occurring since TVX submitted the CCP to DEQ in November 1999. Federal agencies involved in reviewing the CCP and developing issues to be evaluated in the EIS include the USFS, the U.S. Fish and Wildlife Service, and the National Park Service, Yellowstone National Park. State agencies involved have included the Montana Department of Fish, Wildlife and Parks and the Montana Department of Natural Resources and Conservation. Interest group involvement has included the Bear Creek Council, the Greater Yellowstone Coalition, the Jardine TVX Mine Citizens Advisory Committee and others as listed in *Chapter 4*. Citizen involvement has been solicited through two scoping meetings and other informational meetings held in Gardiner, Montana.

## CHAPTER 3

In *Chapter 3*, the affected environment and environmental consequences are described. In this chapter, issues brought forward during the scoping process are examined in greater detail. A total of 10 issues have been brought forward for evaluation in the EIS. The discussion of each issue includes a description of the affected environment, the currently permitted Existing Plan, the Applicant's Proposed Plan, the Agency's Modified Plan, and Cumulative Effects

pertinent to that issue. The ten issues are summarized below.

#### **Issue 1. Tailings Storage Facility (TSF)**

The Applicant's Proposed Plan for the TSF proposes changes in the design of the closure cap, and development of a biological treatment system for seepage draining from the facility. The plan provides for changes in the design of the cap from a water barrier cap to a water balance cap to reduce the likelihood for cap failure and the possibility for damage to the cap over time. Seepage from the TSF would be treated in a series of biological reactors designed to achieve Montana aquatic life and human health water quality standards with the exception of manganese, sulfate, arsenic, and TDS (AKI, 2000a, Appendix C in CCP). Effluent from the biological treatment system would report to a wet meadow habitat development site (HDS) for evapotranspiration. A backup upland HDS would be constructed for additional evapotranspiration capacity during wet years. Modifications proposed by DEQ would provide contingency measures in the event flow through the treatment system is interrupted. The overall effect of the proposed action would be to decrease the load of arsenic to Bear Creek. A reclamation and water treatment bond has been calculated for each alternative.

#### **Issue 2. Crevice Adit Water System Design**

Up to 1,500 gallons per minute (gpm) was encountered during construction of the Crevice Adit in 1994. This water is of high quality and requires no treatment prior to discharge. The volume of the discharge has reduced over time and is now <400 gpm. Fifty gpm of the current flow supplies the Jardine fire district with water and Jardine residents with potable water under a Public Water Supply system permit from DEQ. The Existing Plan would plug the Crevice Adit eliminating the flow. Under the Applicant's Proposed Plan, some of the dewatering drill holes would be plugged, but not the adit itself. This would reduce the volume of flow from the adit to 200 gpm. Jardine would get an improved gravity-driven, buried, 50-gpm water supply system. The high quality Crevice Adit water would be used to ensure the TSF seepage meets ground water standards. Up to 15 gpm of the Crevice Adit flow would be routed by gravity to the upland HDS for mixing with the TSF seepage during unusually high precipitation periods. Modifications proposed by DEQ would require the applicant to utilize Crevice Adit water as a contingency in the event the proposed systems for treatment of discharge from the 1300 Adit and the TSF were down for repair and maintenance. A reclamation and water treatment bond has been calculated for each alternative. The revised MPDES permit would reduce the flow of Crevice Adit water to Bear Creek.

#### **Issue 4. 1300 Adit Discharge**

The discharge from the 1300 Adit pre-dates TVX operations, but modern operations have impacted the flow. As a result, in 1996 DEQ required the 1300 Adit discharge to be regulated as a mine discharge under the MPDES permit program. Under the Applicant's Proposed Plan, the 15 gpm flow would be collected and treated by chemical coprecipitation with ferric sulfate to treat arsenic. The water would be gravity fed in buried pipelines to the Jardine community septic system. The coprecipitation system is a simple proven technology but would require long-term operation and maintenance activities. It would reduce dissolved arsenic levels to below applicable water quality criteria. The Agency Modified Plan and MPDES permit would require the establishment of two additional water quality monitoring stations and two contingency treatment systems should the coprecipitation system be down for repairs or maintenance. A bond for reclamation and water treatment would be calculated for each alternative. The overall effect of reclamation and the issuance of the revised MPDES permit is to decrease the load of pollutants to Bear Creek. The revised permit would result in a reduction of approximately 0.613 pounds of arsenic per day or 70 percent.

#### **Issue 5. Long-Term Monitoring and Maintenance**

Compliance with the MPDES, Public Water Supply system, storm water and operating permits includes monitoring surface water, ground water, process water, and ground movement at the TSF. The Applicant's Proposed Plan involves gradually decommissioning high labor and cost-intensive methods. They would be replaced with more passive treatment systems: The TSF reverse osmosis (RO)/evaporation treatment plant would be replaced by a biological treatment system. The 1300 Adit discharge would be converted from a surface water discharge to treatment by a chemical coprecipitation system. Where possible, pumps would be replaced by gravity-driven systems. The Agency Modified Plan includes bonding for additional long-term hydrological monitoring to verify that the goals of the reclamation plan are being achieved. Three additional water quality monitoring sites would be added as well as contingency measures to ensure water quality standards are met if the proposed treatment systems are down for repairs or maintenance. Adequate bond would be retained by DEQ to perform long-term monitoring and maintenance in the event of default or failure to perform by the applicant.

#### **Issue 7. Future Land Use**

The MHM claim block, consisting of 556 acres, is currently used for wildlife habitat, mine staff housing, recreation, and mining. The Applicant's Proposed Plan for future land uses for the reclaimed mine would essentially be the same as the Existing Plan. The



applicant has indicated that the surface and mineral estate of the property would be donated to the USFS. If the USFS takes over the property, the bond would be released to TVX and the responsibility and liability of the site would be assumed by the USFS. Under USFS management, the land would not be open for location under the 1872 Mining Law. If the USFS becomes the owner of the property, the Federal Government would assume responsibility for long-term future maintenance of the water treatment facilities, including the MPDES and other permits. The land would be removed from the tax base of Park County, and would be unavailable for subdivision activity. The Agency's Modified Plan is the same as the Applicant's Proposed Plan.

#### **Issue 9. Revegetation**

Revision of the design for the cap on the TSF from a water barrier to a water balance cap is proposed to reduce seepage and establish a tree-dominated vegetation cover. Rather than restricting the planting of woody species on the 15-inch thick TSF soil cover and removing naturally invading trees and shrubs, the Applicant's Proposed Plan would enhance the survivability of tree and shrub seedlings and limit grass competition for these species. The water balance cap would use a 48-inch thick soil cover. This is four times as thick as test plot treatments conducted to examine the relationship between the metals content in rooting material and vegetation, reducing overall concerns regarding metal concentration in vegetation. The Agency Modified Plan would require TVX to utilize a mined land revegetation specialist to prepare a revised revegetation monitoring, soil amendment and revegetation plan to ensure tree and shrub survival and allow invasion of native species.

#### **Issue 10. Noxious Weeds**

Increasing the reclamation seeding rate would reduce the potential for noxious weed invasion. TVX has proposed to enhance organic soil matter contents to promote soil microbes and nutrient cycling. The Agency Modified Plan would require monitoring the reclaimed plant community and controlling noxious weeds until Douglas fir seedlings are well established. The Agency Modified Plan would use manure-dominated organic amendments on proposed grassland sites. DEQ would require TVX to use wood-waste organic amendments especially on the TSF. This use of wood waste would help ensure the dominance by Douglas fir and reduce the long-term risk of noxious weed invasion on the TSF.

#### **Issue 11. Bond**

Modifications to the reclamation and water management plans would increase the bond under the Applicant's Proposed Plan. Some of these modifications include the TSF biological treatment

system and two HDS systems, the Crevice Adit closure system, the various soil and organic amendments, more detailed placement of tree, shrub and tubeling nursery stock, and the 1300 Adit water treatment system. The bond under the Applicant's Proposed Plan would include monitoring, maintenance and replacement costs for these elements for 100 years. The bond for the Agency Modified Plan would include contingency plans to insure water quality standards are met if the proposed treatment systems are down for repair or maintenance. Water treatment contingencies have been developed for TSF seepage and the 1300 Adit discharge. Three more water quality monitoring stations have been added by DEQ to monitor water quality. The bond includes operation, maintenance and replacement costs for 100 years of water treatment facilities and the cost for eventual reclamation of the water treatment facilities.

#### **Issue 16. Ground Water**

Continued monitoring of ground water resources is planned as part of the Applicant's Proposed Plan. The goal of this monitoring program would be to verify that mining and reclamation activities have not modified natural trends in ground water elevation and/or quality.

Two additional ground water monitoring locations have been added to the existing water resources monitoring plan. A biological treatment system has been proposed to treat seepage from the TSF and the seepage collection pond would be reclaimed. The wet meadow and upland HDS systems would not require MPDES outfalls because these sites are designed for evapotranspiration of water and do not result in a discharge.

The revised MPDES permit for the 1300 Adit discharge at Outfall 005 proposes that the 0.036 milligrams per liter (mg/L) arsenic background concentration be set as the 30-day average limit. A yearly sample would also be collected from the effluent after discharge from the dosing tank and prior to discharge to the drainfields to ensure that precipitated arsenic is not being re-mobilized or being introduced into the system from other sources.

The Agency Modified Plan would require two contingency plans for the effluent from the TSF (*Appendix D*). Both plans would include the addition of Crevice Adit water to achieve water quality standards. Option A would add as much Crevice Adit water as needed to meet groundwater standards prior to discharge to the upland HDS. Option B would require mixing Crevice Adit water with treated TSF effluent in the wet meadow HDS for subsequent gravity flow discharge to Bear Creek through an existing ephemeral drainage. If the second option becomes necessary, a new Outfall 006 under the MPDES permit would be required.

## Issue 18. Wildlife-Bats

TVX has voluntarily proposed closure of some historic workings for safety reasons. TVX has proposed bat closures on some of these openings to preserve future use by bats. Metal grates designed to permit bat utilization would be installed in the entrances to some of these historic workings based on the evaluation completed by TVX. DEQ does not have any authority under the operating permit to regulate closure of historic openings. The grates would comply with USFS and/or American Cave Conservation Association designs.

No bat grates were proposed on any openings in the Existing Plan. TVX agreed to put bat closures on two current mine openings created as part of Operating Permit 00100. DEQ has added a bond for annual monitoring and eventual replacement of the bat grate at the Crevice Adit and First Chance Portal as part of the Agency Modified Plan. A USFS bat expert would review the proposed closures for concurrence in case the property was donated to the USFS.

The remainder of *Chapter 3* discusses the regulatory framework for consideration of the proposed action and the applicable state and federal laws which need to be addressed.

## CHAPTER 4

*Chapter 4* provides the reader with information regarding the public involvement and scoping process as well as a list of the agencies, organizations and individuals contacted during scoping and review of the EIS.

## CHAPTER 5

*Chapter 5* presents a listing of all references cited in the document.

## APPENDIX A

The agencies have reviewed comments received from the public during the scoping process as well as those received from the agency interdisciplinary team of specialists. DEQ has prepared an Issue Disposition Summary in *Appendix A* that summarizes the comments on the various issues and provides a rationale for why the comment has or has not been discussed in detail in *Chapter 3*.

## APPENDIX B

*Appendix B* is a letter report from Richard Producers of Bighorn Environmental who reviewed the revegetation practices at TVX in September 2000. This report was

used to prepare the Agency Modified Plan changes to the revegetation section of this EIS.

## APPENDIX C

This EIS will serve as the public disclosure document for the revised MPDES which would be needed if the Applicant's Proposed Plan is selected. *Appendix C* includes the MPDES Public Notice, MPDES Fact Sheet and the Draft MPDES Permit No. MT-0030252.

## APPENDIX D

DEQ and TVX worked together to develop passive, gravity-driven contingency plans to treat TSF seepage and the 1300 Adit discharge. *Appendix D* is a memo from TVX to DEQ providing conceptual details for the contingencies used in the Agency Modified Plan.

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## LIST OF ACRONYMS

### ACRONYM

AKI	Amerikanuak, Inc.
BMPs	Best Management Practices
CCP	Consolidated Closure Plan
DEQ	Montana Department of Environmental Quality
DSL	Montana Department of State Lands
EA	Environmental Assessment
EDE	Environmental Design Engineers, Inc.
EDYS	Ecological Dynamic Simulation Model
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
GPM	Gallons Per Minute
GCL	Geotextile Clay Liner
HDPE	High-Density Polyethylene Liner
HDS	Habitat Development Site
IDT	Interdisciplinary Team
MEPA	Montana Environmental Policy Act
MGWPCS	Montana Ground Water Pollution Control System
MHM	Mineral Hill Mine
MMRA	Metal Mine Reclamation Act
MPDES	Montana Pollutant Discharge Elimination System Permit
OTN	Old Tailings North
OTS	Old Tailings South
RO	Reverse Osmosis
SCP	Seepage Collection Pond
SWPPP	Storm Water Pollution Prevention Plan
T&E	Threatened and Endangered Species
TCCLP	Toxicity Characteristic Leaching Procedure
TDS	Total Dissolved Solids
TPO	T. Patrick O'Hara
TSF	Tailings Storage Facility
TVX	TVX Mineral Hill, Inc.
UIC	Underground Injection Control Program/Permit
USFS	United States Forest Service Gallatin National Forest
USGS	United States Geological Survey
WQB-7	Water Quality Bureau Circular 7





# CHAPTER 1 - PURPOSE OF AND NEED FOR ACTION

## INTRODUCTION

On February 16, 2000, Amerikanuak, Inc. (AKI), the operator of the Mineral Hill Mine (MHM), near Gardiner, MT submitted an application to the Montana Department of Environmental Quality (DEQ) to amend the MHM Operating Permit 00100 and modify the approved reclamation plan. The amendment would allow the applicant to update certain elements of the approved reclamation plan to reflect modern industry reclamation practices and water management plans which are more efficient and better calculated to protect the environment. Some changes are made possible or may be preferred because of the significantly less-than-anticipated surface disturbance resulting when mining operations terminated earlier than originally planned. An Environmental Impact Statement (EIS) pursuant to the Montana Environmental Policy Act (MEPA) is needed to evaluate environmental effects of the changes.

## PROPOSED ACTION

The applicant proposes to modify the approved reclamation plan for the MHM located in Township 9 South (T9S), Range 9 East (R9E), Sections 8 and 9 (Figure 1-1). On February 14, 1988 the Montana Department of State Lands (DSL) (predecessor to DEQ) issued Operating Permit 00100 for construction, operation, and reclamation of the MHM. Since that time, one amendment and 19 modifications have supplemented the permit. Where applicable, environmental assessments (EA) were prepared for these changes pursuant to MEPA. TVX owns 556 acres in the Jardine area (Figure 3-1). The permit, as it exists today, covers an area of 424 acres contained within the permit boundary (Figure 1-2). The site consists of the mine area on Mineral Hill, the processing facilities, the Jardine Historic District, and the tailings storage facility. The facility produced gold from 1989 through September 1996. The applicant plans to fully reclaim the mine site.

Only changes proposed to the existing reclamation and water management plans will be evaluated in the EIS. Reclamation requirements that are not being changed will not be evaluated in this EIS. These requirements have already undergone environmental review in the May 1, 1986 Final EIS for the mining project prepared by DSL (DSL and USFS, 1986). This EIS is tied to that 1986 EIS as described below. Some elements of the existing reclamation plan were reviewed and approved for reclamation in 2000 (DEQ, 2000b; DEQ, 2000c). For a description of the applicant's proposal,

please refer to *Chapter 2, Public Participation, Issue Identification, and Alternatives*.

In addition to analysis of proposed changes to the TVX closure plan, this document will serve as the MEPA document for the revised Montana Pollutant Discharge Elimination System Permit (MPDES) No. MT-0030252. The MPDES Public Notice, Fact Sheet and Draft MPDES are attached to this document as *Appendix C* (DEQ, 2001). The conditions and limits to the receiving waters, Bear Creek and ground water, are discussed as part of the issue discussion in this document.

## PURPOSE AND NEED

### Background

The MHM project, as originally permitted, consisted of construction, operation, and reclamation plans. Reclamation, as described in the approved reclamation plan, required activities such as removing structures, closing mine adits, final grading and capping of the tailings, and revegetation of disturbed surfaces.

Mining operations ceased before the originally anticipated life of mine and the property went into care and maintenance mode in 1996. When the decision was made to close the mine, the applicant reviewed the approved reclamation and water management plans. TVX prepared a Consolidated Closure Plan (CCP) for DEQ's review. TVX determined that improvements in technology and advances in industry reclamation practices suggested certain changes to the approved reclamation and water management plans would make the plan more efficient and protective of the environment, especially post-mine water quality.

As a result of the shortened mine life, much of the surface disturbance described in the 1986 EIS has not occurred. For example, the tailings storage facility contains approximately one quarter of the originally permitted tailings volume and surface area (one million tons versus four million tons, and 14 acres versus 55 acres, respectively). The disturbed area to be reclaimed includes 69 acres of combined processing facilities, tailings storage facilities, roads, portals, and development rock piles compared to a permitted total of 106 acres.

### Purpose and Benefits of Proposed Action

The applicant proposes to modify the approved reclamation and water management plans for the MHM. The proposed modifications affect reclamation of the

tailings storage facility, water management and mine adit drainage, soil amendments and revegetation, and historic workings. Whether the plan is modified or not, the site would be reclaimed - no additional mining is planned. The applicant desires to implement the modifications, together with the unmodified already-approved reclamation plan elements.

#### **Decision To Be Made**

The Director of the DEQ must decide whether to approve the proposed amendment (Applicant's Proposed Plan), approve the proposed amendment with conditions needed to reduce or eliminate environmental impacts (Agency Modified Plan), or deny the proposed amendment and reclaim according to the approved reclamation plan (Existing Plan). The Director of the DEQ could select portions of any or all alternatives.

In addition, the authorization to discharge to Bear Creek and ground water is limited by outfalls and pollutant limits in MPDES Permit No. MT-0030252. The Director of the DEQ must comply with the public notice requirements of MEPA before deciding to approve the proposed MPDES permit, or to approve the proposed amendment with conditions developed as a result of public comment received on the draft MPDES permit (*Appendix C*).

#### **Agencies' Roles and Responsibilities**

DEQ is the lead agency for this EIS. It is the only agency from which a permit (i.e., approval of an amendment to Operating Permit 00100 and renewal of the MPDES permit MT-0030252) is needed. The U.S. Forest Service, Gallatin National Forest (USFS), is participating in the EIS process as a cooperating agency. It may become the ultimate land manager for the privately owned MHM property, should the owner follow through with a proposal to donate the surface and mineral estate to the Federal Government. This EIS will not evaluate the transfer of the property from private to USFS ownership, but will consider alternative closure plans and the effect the closure plans may have on future use by the USFS.

DEQ is responsible for hard rock mining permitting and compliance under the Montana Metal Mine Reclamation Act (MMRA). DEQ is also responsible for ensuring water quality under the Montana Water Quality Act and air quality under the Clean Air Act of Montana.

Under MEPA, DEQ evaluates and discloses the effects on the human environment of major state actions. The MEPA process began when the applicant proposed to modify its current reclamation plan.

MEPA regulations contemplate that an Environmental Assessment (EA) or an EIS will be brief and to the

point (analytic, not encyclopedic). Tiering an EIS on a discrete part of a project to the EIS prepared previously for the project as a whole eliminates the need to repeat information and impacts analyses which remain unchanged or are not relevant to the proposed action. This EIS is tiered to the May 1, 1986 Jardine Joint Venture Project Final Environmental Impact Statement and other EAs prepared since 1986 for amendments to Operating Permit 00100. It is also tiered to the April, 1996 MPDES Permit No. MT-0030252, which authorized discharge of untreated ground water to Bear Creek as well as treated wastewater from the tailings storage facility (TSF), and water from the historic 1300 Adit. The MPDES was modified again in 1997.

## CHAPTER 2 – PUBLIC PARTICIPATION, ISSUE IDENTIFICATION, AND ALTERNATIVES

### INTRODUCTION

This chapter describes the proposed action and the alternatives developed during the scoping process. Descriptions of the environmental resources at the MHM and the potential impact for these resources of implementing the proposed action or the alternative are presented in *Chapter 3, Affected Environment and Environmental Consequences*.

In addition, the scoping process and issues, alternatives considered in detail, and alternatives considered but not analyzed in detail are discussed.

### PUBLIC PARTICIPATION

The public has been involved since the application was received by DEQ. A general description of public involvement is located in *Chapter 4, Consultation and Coordination*.

#### The Scoping Process

For preparation of an EIS, MEPA requires a process termed "scoping" (ARM 17.4.615). This is an open process designed to determine the potential issues associated with a proposed action and then from this list to further identify those issues that are potentially significant to the decision. First, comments are obtained from interested and affected parties, both within and outside the agencies, to develop potential issues that should be considered. Second, the interdisciplinary team (IDT) made up of agency specialists reviews these potential issues: 1) the potentially significant issues to be analyzed in depth, and 2) issues which are not significant or which have been covered by prior environmental review, and therefore should be eliminated from detailed analysis.

#### Issue Identification – Potentially Significant and Nonsignificant Factors in the Decision

The purpose of scoping is to identify the potentially significant issues to be analyzed in depth. The potentially significant issues become the focus of interdisciplinary interaction and alternative development. MEPA provides for the identification and elimination from detailed study of those issues which are not significant or which have been covered by prior environmental review. This narrows the discussion of those issues to a brief statement as to why they would not have a significant effect on the human

environment or by providing reference to their coverage elsewhere (ARM 17.4.615(2)(c)).

On February 16, DEQ received a proposal from the applicant to modify the approved reclamation and water management plans to include additional detail and supplemental designs to reflect modern industry reclamation practices and technology (Applicant's Proposed Plan). A description of those plans can be found in the applicant's CCP (AKI, 2000a) and in this chapter.

Initial scoping was conducted on the proposal. A public meeting was held in the Gardiner Eagles Hall on March 15, 2000. Following that meeting the Applicant's Proposed Plan was more widely distributed to locations including the USFS Gardiner Ranger District office in Gardiner, the Gardiner Public Library, and the Yellowstone National Park Headquarters in Mammoth, Wyoming. A scoping document was mailed out on April 4, 2000. The applicant sponsored a workshop on May 22, 2000 which DEQ and the USFS attended. Following the initial scoping effort, DEQ and TVX agreed to prepare an EIS. A formal scoping meeting was held in Gardiner on June 15, 2000. Scoping comments were accepted at the scoping meeting and by mail since that time.

The CCP was reviewed by the agencies and determined complete on December 12, 2000. A number of issues identified during the scoping process were found to not require analysis in the EIS (*Appendix A, Issue Disposition Summary*). A list of all issues and their dispositions can be found in *Appendix A* and Table 2-1. Documentation of the review of comments and issues can also be found in the project record in DEQ files.

The following are the issues generated by agency and public scoping (Table 2-1). These issues are broken into those that are analyzed in the EIS and those that were eliminated from consideration (*Appendix A*). The number sequence corresponds to the issue discussion contained in *Appendix A*.

The issues are not listed in order of importance. Not every issue is discussed in this section of the document. The issues presented do not necessarily involve changes or activities with "significant impacts" materially different from those already analyzed through the MEPA process. Rather, they are issues that may have a different (greater or lesser) impact on the human

environment than has previously been analyzed in a MEPA document. Each issue analyzed in the EIS is considered in detail in *Chapter 3, Affected Environment and Environmental Consequences*. These issues are discussed in detail because they are either a decision factor for the Deciding Official or they are, or have been, of special interest and concern to the public. Each of the issues to be considered in the EIS is described in some detail below.

In addition to discussion of the issues pertinent to the Applicant's Proposed Plan, the Consolidated Closure Plan for the mine, this document serves to provide the mandatory 30-day public review for renewal of the site's MPDES permit pursuant to ARM 17.30. 1372.

### **Issue 1. Tailings Storage Facility (TSF) – Biological Treatment System, Cap Design**

The MHM tailings storage facility (TSF) was permitted and constructed as a closed circuit "dry" tailings facility. The tailings were dewatered in the mill to separate the spent ore from the process solution. Moisture contents of roughly 18-20 percent were achieved. The dewatered tailings were then trucked to the TSF where they were dumped and compacted into a dense low-permeability deposit. The TSF was constructed on top of a double layer impermeable liner and drain tile system. Residual water from the tailings and any precipitation percolating through the pile are intercepted by the drain tiles and report from the south side of the TSF into the seepage collection pond (SCP). The SCP also must collect all storm water runoff to prevent impacts to surface water. The seepage and runoff do not meet water quality standards and are treated with pH adjustment, settling, and two stage high pressure reverse osmosis (RO) before release to Bear Creek under a Montana Pollutant Discharge Elimination System (MPDES) permit in Outfall 002.

Concerns have been raised regarding 1) the proposed TSF seepage biological treatment system and 2) the effectiveness of the proposed water balance cap design in reducing percolation. Effects from the TSF cap design alternatives such as revegetation potential, root penetration, tree fall, fire and climatic effects are of concern. Long-term water treatment of TSF seepage is also a concern and has been addressed by modifications proposed by the applicant (Applicant's Proposed Plan) and agency-proposed revisions to the CCP (Agency Modified Plan) and the MPDES permit (*Appendix C*).

Residual drainage from the TSF would continue for an indefinite period of time. The existing approved plan provides for no water treatment. The proposed action would employ a biological treatment system that has been successful in other situations (AKI, 2000a, *Appendix 6*), and has been evaluated in the specific context of the MHM. The proposed treatment system

would require a modification of the existing MPDES permit (*Appendix C*).

An issue under consideration in this EIS is whether to change the cap design from one containing a low-permeability, bentonite-amended tailings layer (i.e. water barrier) sandwiched between the tailings and covering soil, or to eliminate the low-permeability layer in favor of a thicker water balance cap.

### **Issue 3. Crevice Adit Water System Design**

Water discharges from the Crevice Adit to Outfall 001 are currently permitted under an MPDES permit. Three outfalls to Bear Creek have been permitted. The first is the discharge from the TSF underdrain system following treatment as mentioned in Issue 1. The second is a combined outfall of two mine drainage sources: 1) The Crevice Adit water, which is of high quality and requires no treatment prior to discharge, and 2) the 1300 Adit water, which has elevated levels of arsenic, and is discharged to Outfall 003 (discussion in Issue 4 below).

The combination of the two mine discharges results in no measurable impact to Bear Creek water quality. Proposed reclamation activities would modify the Crevice Adit water system design in that the pipeline from the Crevice Adit to Bear Creek would be buried below frost depth (6 feet). The 1300 Adit drainage line would be separated from the Crevice Adit drainage line as discussed under Issue 4 below.

The proposed Crevice Adit water system design would plug some of the drill holes in the adit to reduce flows to about 200 gpm. An artesian well would be redesigned as a gravity flow water supply system of up to 50 gpm for use by the Jardine fire district.

Another buried pipeline would carry the rest of the 150 gpm flow to Bear Creek for discharge. Up to 15 gpm could be split from the 150 gpm pipeline to supply water for diluting TSF seepage in wet years before the TSF seepage reports to the upland habitat development Site (HDS).

These changes to the Crevice Adit and TSF seepage treatment methods would require modification of the MPDES permit (*Appendix C*). The original MPDES permit issued in 1996 and modified in 1997 was based on a combined flow from the Crevice Adit, treated TSF seepage from the RO plant and 1300 Adit of 1,350 gpm to Bear Creek. Of this discharge, 50 gpm was from the TSF seepage treatment system. Concerns have been expressed about the changes to the existing systems because the water currently meets water quality standards before discharge to Bear Creek.

#### **Issue 4. 1300 Adit Drainage**

Currently the 1300 Adit drainage from Outfall 003 is discharged to Bear Creek with the Crevice Adit water under an MPDES permit as discussed above under Issue 3. Under the proposed plan, discharge of 1300 Adit water directly to Bear Creek would be eliminated. The 1300 Adit discharge line would be separated from the Crevice Adit water line, buried, and the drainage treated in a chemical addition building with ferric sulfate and routed to the existing septic tank. The treated effluent would be discharged from the dosing tank into the two drainfields at Outfall 005. This may require authorization under the EPA Underground Injection Control (UIC) program and would require revisions of the existing MPDES permit (*Appendix C*).

Currently, nitrate concentrations are elevated but not above the Montana ground water quality standard. The arsenic concentration is above the Montana ground water quality standard and would be treated through coprecipitation with ferric sulfate and settling in the septic tank.

Concerns have been raised about the effectiveness of this proposed system and long-term care and maintenance of the system.

#### **Issue 5. Long-Term Monitoring and Maintenance**

The Applicant's Proposed Plan contains a long-term monitoring plan designed to test for the success or failure of reclamation. Funding of the ongoing monitoring and maintenance requirements is an important consideration. The current bond would be revised to reflect agency evaluation of the cost to support long-term monitoring and maintenance activities and to reflect reclamation performed to date (Issue 11- Bond).

Many concerns were expressed about the amount of bond needed to manage the three proposed water management systems long term. Also, questions were raised regarding what would happen to the bond if TVX donated the property to the USFS.

#### **Issue 7. Future Land Use**

The applicant has proposed to donate the 556-acre patented surface and mineral estate to the USFS. As donated lands, the site would be managed as an "acquired" land donation. Acquired lands are not subject to the 1872 Mining Law. The USFS can prohibit mining without withdrawing the lands from mineral entry. The USFS has suggested the site would be managed for recreation, historic interpretation, and education. DEQ would evaluate the reclamation and water management activities with USFS review in light of potential future management of the site by the USFS.

Should the site become public property, future mining would be unlikely.

The purpose of this EIS is not to analyze the potential environmental impacts of transferring ownership of the property to the USFS. It only considers the effects the mine closure alternatives may have on future land use if the USFS obtains the property.

#### **Issue 9. Revegetation**

Concern has been expressed regarding the vegetation communities that would be established by reclamation activities, especially on the TSF. Some minor modifications of the seed mixes have been made to include more native species based on recommendations from Yellowstone National Park botanists. DEQ will determine whether the proposed seed mixtures and seedling plantings meet the established goals of the approved plan. Other concerns have been raised about long-term effects from grazing, fire and tree-dominance on the TSF.

Concerns have also been expressed because TVX has proposed the use of imported soil and organic matter amendments. These materials may increase revegetation success but may introduce noxious weeds (Issue 10-Noxious Weeds).

#### **Issue 10. Noxious Weeds**

Park County requires control of noxious weeds under the Montana County Noxious Weed Control Act. The applicant has conducted a program of weed control through mechanical and chemical means for many years. An issue has been raised regarding continuing successful noxious weed control during and following reclamation especially when and if the USFS takes over the property.

Concerns have been expressed because TVX has proposed the use of imported soil and organic matter amendments. These materials may increase revegetation success but may introduce noxious weeds, especially spotted knapweed.

#### **Issue 11. Bond**

An important aspect of the MMRA permitting system is to assure adequate financial resources are available to reclaim mining sites in the event the operator becomes insolvent or is no longer available to perform the permitted reclamation. The appropriate bond for the Applicant's Proposed Plan and alternatives will be assessed. An important scoping issue in the EIS is the amount of bond needed for reclamation. TVX would be required to modify the current bond amount to reflect the selected closure plan.



The modified bond will include funding for long-term operation and maintenance of water treatment systems for 100 years. At such time as the property is transferred to the USFS, the operational responsibilities of the site would also transfer, just as if they were a private corporation purchasing the property. This would include any obligations under Operating Permit 00100, including bonding. That is, the USFS would have the obligation to fund ongoing operation of the treatment systems, weed control, monitoring, etc. as described in the approved plan. Upon assignment of the permit to the USFS, DEQ would release TVX from any financial obligations under that permit, and release their bond. The USFS, as a government agency, would not be required to post a bond under the Metal Mine Reclamation Act (Title 82, Part 4, MCA).

#### **Issue 16. Ground Water**

The presence of nitrate and arsenic in ground water has been raised as a scoping issue. A plan to address nitrate levels in monitoring well MW-10 has been approved by DEQ and is being implemented. The plan will be integrated into the overall EIS analysis of the reclamation alternatives.

Increasing trends in arsenic levels have been observed in some monitoring wells. The effectiveness of the reclamation alternatives to address this issue will be assessed in the EIS. Effects on ground water from the proposed TSF seepage treatment system and the 1300 Adit discharge in the septic tank drainfield will also be evaluated in this document as well as the revised MPDES permit (*Appendix C*).

#### **Issue 18. Wildlife – Bats**

The potential impact to bats has been raised as an issue to be considered. DEQ will address measures in this EIS to preserve future potential bat use of mine openings proposed for closure at the MHM.

#### **Montana Pollutant Discharge Elimination System Permit**

Changes proposed by TVX, as part of the Applicant's Proposed Plan would require alteration of the existing MPDES permit for the MHM. Improvement in water quality as a result of reclamation and water treatment methods, as well as the development of contingency measures, has resulted in the need to revise the existing permit basis and to document new proposed outfall locations. This document will serve as means for public disclosure of the new effluent calculations contained in the proposed MPDES. A copy of the draft MPDES permit is attached to this document (*Appendix C*).

## **ALTERNATIVES CONSIDERED IN DETAIL**

### **Development of Alternatives**

The interdisciplinary team (IDT) reviewed and analyzed the relevant issues and factors and used this information to identify three alternatives: 1) no action (i.e., implement the Existing Plan), 2) the Applicant's Proposed Plan, and 3) the applicant's proposed plan with agency modifications (Agency Modified Plan). Based on the potentially significant issues identified through scoping and other decision factors, no other alternatives were determined to be reasonable and relative to the purpose and need of the applicant's proposal.

### **Existing Plan**

The MEPA requires consideration of a "no action" alternative (ARM 17.4.617(5)). In the case of the MHM reclamation, the no action alternative is implementation of the existing approved reclamation and water management plans.

A total of 69 acres would be reclaimed. This acreage constitutes all acres disturbed under Operating Permit 00100, including parts of Mineral Hill, the facilities area, the mine openings, the old tailings south (OTS) an historic deposit of tailings in the permit area, development (waste) rock piles, and the TSF (Figure 2-1).

Some areas were reclaimed in 2000 after DEQ review indicated that the changes to the reclamation plan were not significant and didn't need to be evaluated in this EIS (DEQ, 2000b; DEQ, 2000c).

TVX obtained MPDES Permit No. MT-0030252 in April of 1996 for the discharge, at Outfall 001, of untreated ground water from drill holes in the Crevice Adit. The MPDES permit was modified several times through 1999 to allow for the discharge of treated wastewater as well as water from the historic 1300 Adit which had been impacted by recent mine development.

During the past 2 years, drawdown of ground water and the grouting of drill holes have reduced the volume of unaltered Crevice Adit water being discharged from Outfall 001. Water discharging from the historic 1300 Adit has also decreased in volume from approximately 50 gpm to 15 gpm.

Bear Creek in the area of the discharge is classified as "B-1" [ARM 17.30.623(1)]. Waters classified "B-1" are considered suitable for drinking, culinary, and food-processing purposes, after conventional treatment; bathing, swimming, and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl, and furbearers; and agricultural and industrial water supply [ARM 17.30.623(1)]. Bear Creek is listed



as impaired for aquatic life support and cold water fishery on the 1996 Montana List of Waterbodies in Need of Total Maximum Daily Load (TMDL) Development [Clean Water Act Section 303(d)]. The probable cause of impairment is listed as habitat alteration and the probable source is listed as mill tailings and placer mining.

#### TSF Underliner Extension and Regrading

In 2000, the TSF underliner was extended to the north within the current footprint of the alluvial gravel borrow pit (Figure 2-2). The OTS tailings have been completely excavated and transferred to the TSF (Figure 2-3). A total of 110,000 cubic yards (cy) of OTS tailings were placed on the TSF, resulting in a landform that is slightly higher and extends slightly farther north than the unreclaimed pile. The slope north of the TSF was graded at 4:1 or less. A drainage diversion bench would be graded into the slope at approximately mid slope (Figure 2-2) to capture runoff from the upper slope in 2001.

The upper TSF access road and upslope diversion channel would be converted to an oversized diversion channel. The angle of the cut slope would be reduced, and the channel capacity would be increased (Figure 2-4). The lower section of the upslope diversion channel already exists. The upslope TSF diversion channel is sized to carry the 500-year event without overtopping the banks.

No changes to the TSF regrading plan are proposed in the Applicant's Proposed Plan.

#### OTS Area Reclamation

The underlying buried native soil would be seeded and revegetated directly. TVX completely removed the OTS as well as a minimum of 13,000 cy of contaminated soil beneath the OTS in 2000. The materials were placed in the TSF. The OTS area was graded, soiled and seeded. TVX added soil to the area even though it was not required in the Existing Plan.

A drainage channel was reestablished through the OTS area in the approximate location and at the approximate profile that existed prior to any mining disturbance. The diversion channel contours around the TSF and would reenter the undisturbed native channel when completed in 2001 below the SCP (Figure 2-3). A ramp would be constructed through the SCP to carry the diversion channel, and an energy dissipation structure would be constructed at the confluence with the native channel (Figure 2-4). Locally available competent riprap would be used to construct the energy dissipation structure. The diversion channel would be sized to carry the 500-year flood without overtopping the channel banks.

#### Development (Waste) Rock Piles

Development rock pile reclamation was modified in 1997. DEQ reviewed the TVX Acid Rock Drainage (ARD) characterization of the development rock piles in 2000 and concluded that the piles are not acid generating (AKI, 2000a). TVX started reclamation of the rock piles in 2000.

TVX has not proposed any changes to the development rock pile reclamation.

#### Facilities

All facilities constructed under Operating Permit 00100 would be removed except those left for use as water treatment facilities under the MPDES. These facilities have not been bonded for removal when water treatment is no longer needed.

The only facilities to remain in the TVX CCP would be those needed for the post-mine water management systems. TVX's proposed treatment plans might modify the reclamation schedule for some of the facilities if used as part of the proposed water treatment systems. These facilities have not been included in the bond for removal when water treatment is no longer needed.

#### Historic Openings

No reclamation of historic mine openings would occur under the Existing Plan.

TVX has proposed to reclaim some mine openings. These would be reclaimed outside the purview of the MMRA.

#### Reclamation Plan Elements That May Be Changed

The existing reclamation and water management plans for facilities left to reclaim, include the following elements:

##### TSF Cap Design

A water barrier cap would be constructed on the TSF. The upper 9 inches of the tailings would be mixed with bentonite clay and compacted. A 15-inch-thick cap would be placed over the tailings, consisting of a 3-inch gravel drain layer and 12 inches of soil (Figure 3-3). Historic tailings from the OTS could be used for the clay-amended layer.

TVX proposes to change the approved cap design.

### TSF Seepage Collection System

A double layer impermeable liner underlies the TSF. Precipitation and residual process solution would continue to drain through the pile to the high-density polyethylene underliner (HDPE). This water is collected by a drain system and gravity discharged to an adjacent SCP. The Existing Plan said that seepage would be evaporated from the SCP or used to irrigate the revegetation on the impoundment surface. When seepage rates become negligible, the seepage collection pond would be filled with the pond bank material and reclaimed (DSL and USFS, 1986, p. III-12). There would be no long-term treatment of tailings seepage.

The Existing Plan is not implementable because of water quality concerns. Seepage is currently being treated under a MPDES permit. The current reclamation plan calls for leaving the SCP as a small lake and continuing to treat the seepage under the MPDES permit. Seepage could be irrigated on the revegetated surface of the impoundment if needed as a contingency if the RO/evaporation plant was down for repairs or maintenance.

TVX has proposed a change in the seepage treatment process.

### Crevice Adit Discharge

As part of Exploration License 00559, the Crevice Adit would be plugged with grouted aggregate to stop water from flowing out the Portal.

TVX has proposed a change to the current Crevice Adit closure plan and water management system.

### 1300 Adit Discharge

No treatment or management of the 1300 Adit discharge would take place. The historic flow was impacted by the mine operations under Operating Permit 00100.

1300 Adit discharge is currently being treated under the MPDES permit by mixing with Crevice Adit water.

TVX has proposed an alternative treatment system.

### Long-term Monitoring and Maintenance

In the Existing Plan, monitoring and maintenance of the reclaimed site is not prescriptive. Other existing permits, such as the MPDES and storm water permits and associated SWPPP, specify hydrologic monitoring (surface water, ground water, process water, and storm water) to ensure compliance. Once the site has been successfully reclaimed, the storm water permit would be vacated, along with the SWPPP, including the

associated monitoring. The only ongoing monitoring of reclamation features would be through the MPDES permit. DEQ has bonded for 5 years of water quality monitoring.

TVX has proposed long-term monitoring and maintenance plans. DEQ needs to bond for long-term monitoring and maintenance for 100 years.

### Future Land Use

The Existing Plan proposes to reclaim the site to wildlife habitat and livestock grazing which are consistent with current land uses. DEQ evaluated and concluded that the Existing Plan would meet the post-mine land use objectives and goals in the 1986 EIS.

TVX has proposed donating the property to the USFS. The USFS may propose different land uses.

### Revegetation

Revegetation would be accomplished using two seed mixes, a grassland mix and a mix of grasses and forbs associated with a Douglas fir forest. Revegetation of the TSF would include grasses and forbs. Douglas fir seedlings would be planted on the development rock piles only. Trees would be removed from the TSF.

TVX has proposed changing the TSF revegetation plan and would use imported soil and organic amendments because trees and shrubs would limit infiltration more than grasses.

### Noxious Weed Control Program

The project area has limited noxious weeds as a result of the company's weed control efforts since 1986. Weed seed sources from surrounding public and private lands continue to increase the threat of noxious weed invasion. The site noxious weed control program would be continued through the reclamation process until final bond release.

TVX has proposed to import soil and organic matter that would increase the risk of noxious weeds.

### Bond

Bond for the Existing Plan is currently in the form of an irrevocable letter of credit and totals \$7,606,826. TVX would have to post an additional \$1,124,400 in July 2001 if significant progress has not been made to reduce reclamation commitments by then (Table 3-7). TVX also has a \$100,000 irrevocable letter of credit posted for exploration disturbances under Exploration License No. 00559.

Regardless of which closure plan is selected, the bond would be recalculated as part of the final decision on a closure plan.

#### Wildlife

No provisions in the Existing Plan or analysis were made for potential bat use of mine workings. TVX voluntarily put a bat closure on the First Chance Portal in 2000.

#### Applicant's Proposed Plan

The Applicant's proposed reclamation plan contains the following components that differ from the existing reclamation plan as listed above (AKI, 2000a):

#### TSF Cap Design

The proposed TSF cap is a water balance cap intended to store most of the infiltrating water until the plants seasonally remove the stored water, thus limiting percolation through the tailings pile (Figure 3-3). The upper 12 inches of tailings would be compacted, 36 inches of granular subsoil would be placed over the tailings, and 12 inches of soil would form the surface layer (Figure 2-4). This 48-inch growth medium would replace the 15-inch growth medium in the Existing Plan. The cap would then be vegetated. Final contours would blend with the surrounding glacial terrace landforms (Figure 2-2).

The proposed water balance cap design does not include the water barrier component of 9 inches of compacted bentonite-amended tailings as in the Existing Plan.

#### TSF Seepage Management

The water balance cap is intended to limit percolation below the root zone and into the underlying tailings. However, some water could percolate below the root zone during snowmelt or intense thunderstorms. This water would eventually reach the underliner and report to the seepage collection system as in the Existing Plan. Seepage in the Existing Plan is treated in the RO/evaporation plant under the MPDES permit and discharged to Bear Creek in Outfall 001. RO brine is evaporated.

TVX proposes that seepage would be treated in a biological treatment system at the south end of the TSF (Figure 2-5). The system would consist of four steps contained in separate concrete vaults.

- First step - an alkalinity addition chamber using limestone gravel to control any excess acidity.

- Second step - a chamber to precipitate metals under aerated alkaline conditions.
- Third step - a biological reduction chamber to consume oxygen. Anaerobic bacteria would reduce (consume) sulfate, causing metal sulfide compounds to precipitate.
- Fourth step - a biological oxidation chamber where aerated conditions would precipitate residual manganese and iron.

Outflow from the biological system would flow by gravity to the wet meadow HDS established in the existing SCP area. The lined SCP would be backfilled and revegetated. Effluent from the biological system would be evapotranspired by the wet meadow vegetation, which would in turn produce more biomass as a result of the supplemental water source.

During atypically wet years (calculated to be once in the first 20 years) the wet meadow HDS would not consume all the treated water. TVX has developed a contingency measure to ensure water quality is maintained. Overflow from the wet meadow HDS would report to a horizontal drain tile located on the south side at the overflow elevation. The drain tile would be connected, under gravity flow, to the pump sump for automatic pumping to the upland HDS. This treated water would be mixed with up to 15 gpm of Crevice Adit water and discharged to the soil (Figure 2-6 and Figure 1, *Appendix D*). Application rates would be less than the agronomic uptake rate of the plant community. The system would be operated as a zero discharge facility, and no discharge permit would be required.

The applicant would operate the existing RO/evaporation water treatment plant while operating and monitoring the influent and effluent of the biological treatment system at the TSF. The RO/evaporation system would be maintained until TSF seepage would drop below the performance criteria of 1.0 gpm. It would also be maintained until it is shown to the satisfaction of DEQ that the passive biological treatment system adequately prevents degradation of surface and ground water resources.

#### Crevice Adit Water System Design

An MPDES discharge permit is in place for the current adit drainage. The Crevice Adit water is of good quality and contains no elevated metals. Drainage seeping into the adit from the adit walls is collected in a ditch, which reports to a sump. From the sump it is pumped to discharge in Bear Creek at Outfall 001 through a surface HDPE pipeline.

In the Applicant's Proposed Plan, drill holes that produce most of the discharge water would be plugged. Even so, the adit itself would continue to function as a

large horizontal well. TVX has monitored flow at four places along the length of the Crevice Adit. Adit seepage measured on the floor of the adit (sill) has been roughly 150 gpm for some time. The decant wells produce another 200 gpm. Flow from the adit after drill hole plugging is anticipated to be about 150 gpm. A buried gravity pipeline would carry this water to MPDES Outfall 001 in Bear Creek (Figure 2-6).

One well in the Crevice Adit has been completed as a public water supply well for the Jardine Historic District. The current system is a surface pipeline. This well has a maximum yield of 50 gpm. During winter, water overflows to Outfall 001 from the 50,000-gallon water supply storage tank to protect against freezing of the tank intake. The tank overflow rate is generally less than 20 gpm.

Under the Applicant's Proposed Plan, a separate buried pipeline would be built to carry by gravity up to 50 gpm of the flow as potable water from the permitted water supply well located within the Crevice Adit to the 50,000-gallon water supply tank located upslope of the current mill structure (Figure 2-6). This water would be available for domestic use (e.g. drinking) and fire protection in the Jardine area. To prevent winter freezing in periods of no demand, up to 50 gpm would overflow the tank via the outlet pipe and be discharged to Bear Creek at Outfall 001 (Figure 1, *Appendix D*).

A secured bulkhead with a locking door would be constructed in the Crevice Adit Portal to control access. TVX has voluntarily proposed a bat grate for the Crevice Adit to preserve future bat use.

Crevice Adit water meets state water quality standards. No contingency plan has been developed for its treatment (*Appendix C*).

### 1300 Adit Drainage

The 1300 Adit is the lowest draining adit connected to the MHM workings. Water intercepted by the mine workings reports to the 1300 Adit and discharges to Bear Creek at Outfall 003 under a MPDES discharge permit. Adit drainage would be captured via a frost-free inlet and piped via a buried pipeline to a chemical addition building located near the existing septic tank (Figures 2-7, 2-8 and 2-9). Chemical coprecipitation of arsenic by ferric sulfate would occur in the chemical addition building. Settling would occur in the septic tank. Effluent would percolate through the two existing leach fields, which are designed to manage 20 gpm of 1300 Adit flow (Figures 2-10 and 2-11). The 1300 Adit drainage has been less than 13 gpm since November 1999 (Figure 2-12). This plan would eliminate a discharge source to Bear Creek. Percolation to the septic drainfields would require a Montana ground water discharge permit. This discharge point has been

identified as Outfall 005 in the revised MPDES permit (*Appendix C*).

### Long-term Monitoring and Maintenance

Hydrologic monitoring described in the Applicant's Proposed Plan includes surface water, ground water, process water, and storm water monitoring. Seepage from the TSF would be treated in a RO/evaporation unit. It would be monitored until the baseflow seepage rate is less than 1.0 gpm and the biological treatment system is performing consistent with bench scale results. Inflow and outflow of the system would be monitored. It is anticipated the RO/evaporation unit would be decommissioned in 2002. Seepage from the TSF would be treated in a non-discharging, passive biological treatment and evapotranspiration pond system in the SCP (*Appendix C*). The revised draft MPDES permit reflects these changes. When the TSF and SCP are reclaimed, the SWPPP would no longer be needed. The system would be zero discharge in roughly 19 of 20 years. During that 1 year, discharge to the soil would be below ground water standards.

The CCP contains a detailed plan for confirmation monitoring of reclamation success. Revegetation would be monitored until 80 percent canopy cover is achieved and second growing season predicted biomass yield of 715 pounds/acre (lb/acre) is achieved based on EDYS model results. The TSF has been monitored for slope stability until angles were equal to or less than those depicted in Figure 2-2. Rilling and gullying has not occurred. Erosion monitoring would be by visual inspection following regrading.

Facility maintenance includes weekly inspection for access and functionality of the Crevice Adit, with repair as necessary. The 1300 Adit chemical addition building would be inspected weekly with system repair and addition of reagents on an as needed basis. The TSF RO/evaporation treatment system would be inspected daily, during operation. Operation of this facility would continue until the biological treatment system meets design criteria. The TSF biological treatment system and Jardine water supply system would be inspected weekly and repaired as necessary.

### Future Land Use

TVX proposes the same post-mine land uses as the Existing Plan with the exception that it would develop an improved public water supply system for use by the Jardine community. If the USFS takes over the property, additional forms of land use including recreation, historical interpretation and education would be considered.

### Revegetation

New seed mixes were developed for the CCP and revised based on comments from botanists from Yellowstone National Park (AKI, 2000a). Native species would be used if available from suppliers when needed. The National Park Service and the USFS have reviewed these species lists. A third seed mix could be added to the plan that includes big sagebrush, rabbitbrush, and Idaho fescue but has not been proposed by TVX. The seeding rate for the proposed mixes would be 65 pounds per acre (lb/acre). The proposed seed mixes are very similar to those proposed in the Existing Plan but the seeding rate has been doubled.

Revegetation of the TSF would include planting Douglas fir tubelings in addition to grass and forb seed at a rate of 400 trees/acre. The applicant has initiated a program of seedling production from local seed sources. The applicant has proposed planting trees and shrubs on the TSF because woody plant dominated communities use more water (Table 3-2).

The planting of woody species contrasts with the Existing Plan that depends on removal of woody plants to prevent compromise of the clay barrier layer.

The applicant has proposed thicker soil covers on the TSF. To make up for soil shortfalls, the applicant proposes to use on-site alluvial borrow materials. In addition, the applicant proposes to use an imported soil source and various organic amendments to increase soil quality on all sites being reclaimed.

This use of imported soil and organic amendments was not part of the Existing Plan.

### Noxious Weed Control Program

The current approved site noxious weed control program would be continued through the reclamation process until final bond release or until the USFS takes over the site. If the USFS takes over the site they would be responsible for the weed control activities. Weed control efforts would include:

- Observing soil stockpiles and borrow areas for weeds;
- Washing equipment prior to entering the site;
- Using organic material from certified weed free sources as soil amendments if possible;
- Composting horse manure;
- Testing manure, compost, and other organic amendments or soils imported from offsite according to procedures outlined by the applicant (AKI, 2000a). Results would be submitted to DEQ;

- Conducting weekly reconnaissance trips over the entire TSF and other reseeded areas, once the materials have been placed. Notes would be taken as to the locations and approximate amounts (e.g., few, moderate, abundant) of any weeds that begin to establish. Isolated plants would be removed by hand. Larger populations would be treated with appropriate mechanical or chemical means; and
- Implementing mitigation measures listed in the applicant's proposal (AKI, 2000a) in the event the seed bank germination tests indicate significant amounts of cheat grass or noxious weeds.

### Bond

If the CCP was approved, the bond would include amounts for areas reclaimed under the approved unchanged Existing Plan as well as the new bond amount for the changed reclamation plan proposed in the CCP. The bond would also include operation and maintenance of water treatment facilities for 100 years.

### Wildlife

The Existing Plan did not consider the potential use of underground workings by bats when permitted in the 1986 EIS. TVX has not proposed any bat closures on historic mine openings. TVX did put a bat grate on the First Chance Portal at the request of DEQ in 2000. TVX has only proposed one bat closure on the Crevice Adit opening.

### Agency Modified Plan

The following modifications would be made to the applicant's proposal as integral parts of the Applicant's Proposed Plan.

### Water Management Systems

Final designs would be required for the following reclamation features:

- The TSF biological treatment system.
- The 1300 Adit treatment system.
- The Crevice Adit pipelines.

### Long-term Monitoring and Maintenance

For contingency plans, DEQ would require additional monitoring of water exiting the Crevice Adit/TSF seepage overflow mix box. The 1300 Adit water would also be monitored after it leaves the chemical addition building and before it leaves the dosing tank to ensure treatment is effective. The TSF seepage after mixing with Crevice Adit water in the wet meadow HDS would



be monitored to ensure surface water standards would be met (Figure 1, Option B, *Appendix D*).

#### Revegetation

A TSF revegetation-monitoring plan would be required. DEQ would require TVX to hire a revegetation consultant acceptable to DEQ to develop a monitoring plan for revegetation.

The revegetation plan would decrease the seeding rate and eliminate all introduced species per recommendations by Producers, 2000b (*Appendix B*).

#### Bond

Bond would include contingency treatment methods until:

- o the TSF biological treatment system is proven;
- o the TSF seepage treatment in the upland HDS is proven; and
- o the 1300 Adit treatment method is proven

See the discussion above under Water Management Systems.

#### Contingency Plans

The DEQ would bond for contingency treatment scenarios in case the preferred alternatives of treatment are down for repair or maintenance (Figure 1, *Appendix D*).

##### *Crevice Adit*

The discharge from the Crevice Adit at Outfall 001 would not require a contingency plan because no treatment is required.

##### *TSF Seepage*

The RO/evaporation treatment system for the tailings storage facility seepage associated with Outfall 002 is anticipated to be decommissioned and the outfall terminated in 2002. If the seepage continues above 1.0 gpm for a longer period, the existing evaporation system can handle the flow. When the RO/evaporation system is decommissioned, the effluent issuing from the tailings storage facility (approximately 1.0 gpm) would be treated in a nondischarging biological and evapotranspiration pond system in the SCP. This system is referred to as the wet meadow HDS.

Three contingency plans have been developed for the disposal of TSF water in the event that the treatment system is down for repair or maintenance or more water

than anticipated is generated from the TSF. The first and preferred contingency option developed by TVX (Figure 1, *Appendix D*) would be to pump the water from the lower lined, wet meadow HDS to the unlined, upland HDS system above the TSF (Figure 2-6). The upland HDS is underlain by a drainfield system. The effluent from the TSF would be mixed with 15 gpm to ensure ground water quality standards are met before water is discharged to the upland HDS.

The first option developed by TVX and DEQ would increase the potential contingency Crevice Adit flow from 15 gpm to as much as 184 gpm to dilute the mixture to the ground water arsenic standard of 0.02 milligrams per liter (mg/L) prior to discharge (Figure 1, Option A, *Appendix D*).

These two contingency plans would not require a permit if the water were applied at agronomic rates. If agronomic rates are exceeded, a new outfall could be requested through the MPDES permit process. This outfall would be permissible under the MPDES rules, as all water quality standards would be met prior to discharge. There would be slight increases over the narrative guidelines for iron and manganese but no specified uses would be impaired.

A third contingency plan developed by TVX and DEQ would require the mixing of up to 200 gpm of Crevice Adit water (up to 200 gpm) with the TSF seepage in the wet meadow HDS. The effluent from the HDS would overflow for subsequent discharge to Bear Creek via an existing ephemeral drainage (Figure 1, Option B, *Appendix D*). A pipeline would not be needed as the drainage can easily handle the projected occasional flow without erosion and turbidity concerns. This contingency would require a new MPDES Outfall 006 if ever used, but existing effluent limits developed for Outfall 001 could be met and the outfall would be permissible under the MPDES rules.

Finally, seepage from the TSF could be irrigated on the TSF during the growing season if the passive water treatment systems were down for repairs or maintenance.

##### *1300 Adit*

The preferred TVX alternative for the discharge of 1300 Adit water is through treatment and discharge to ground water at Outfall 005 in the existing septic tank system (Figures 2-7, 2-8 and 2-9). TVX has identified one contingency option that would mix 10-20 gpm of Crevice Adit flow with the effluent out of the chemical addition building in the dosing tank (Figure 1, *Appendix D*).

TVX and DEQ identified two other contingencies to ensure water quality standards would be met (Figure 1, Options C and D, *Appendix D*). If the treatment system

was down for repair or maintenance, up to 190 gpm of Crevice Adit water could be mixed with the 1300 Adit water prior to discharge at Outfall 005. The Crevice Adit water would be added to the dosing tank and monitored to ensure ground water standards were met before the effluent entered the drainfield. This contingency could be permitted under the MPDES rules.

TVX and DEQ have added another backup plan for the 1300 Adit water. A buried pipeline would be constructed to take the average 15 gpm of 1300 Adit water and mix it with the Crevice Adit water for discharge in Bear Creek at Outfall 001 (Figure 1, Option D, *Appendix D*). This is the same plan as is permitted today for the 1300 Adit discharge and would only be used if the other contingencies were not available.

### Wildlife

TVX has voluntarily agreed to install bat grates on eight of the historic openings including: Iron Duke incline, lower adit, north adits; Graham Claim lower mine; Elk Tunnel; 900 Level, tunnel #4 904; 1000 Level, Tunnel 14, 1014; 1000 Level, Tunnel 16, and 1016 in consultation with the USFS and the Montana Department of Fish, Wildlife and Parks (Maxim Technologies, Inc., 2000b).

The only bat grate proposed on current mine openings to preserve potential future bat use is in the Crevice Adit. TVX voluntarily agreed to put a bat grate on the First Chance Portal which was reclaimed in 2000. Bond would be held for monitoring of these two bat grates annually.

### **Comparison of Alternatives**

Table 2-2 summarizes the differences between the Operational Conditions (Affected Environment), Existing Plan (no action), the Applicant's Proposed Plan, and the Agency Modified Plan. A more in-depth discussion and comparison of the environmental consequences of each of these alternatives is found in *Chapter 3, Affected Environment and Environmental Consequences*.

Table 2-3 summarizes the differences in impacts between the Operational Conditions (Affected Environment), Existing Plan (no action), the Applicant's Proposed Plan and the Agency Modified Plan. A more in-depth discussion and comparison of each of the alternatives is found in *Chapter 3, Affected Environment and Consequences*.

### **Alternatives Considered but Dismissed**

A previous plan to discharge the 1300 Adit drainage to the flooded Ski Slope workings was withdrawn because one domestic well exists within a projected mixing zone for arsenic. Montana water quality standards do not

allow domestic wells within mixing zones (ARM 17.30.508(2)).

TVX originally proposed to steepen the TSF reclamation slopes. The plan was withdrawn when TVX realized that the OTS could be placed on the TSF and not exceed the permitted slope gradients.

TVX also originally proposed to reclaim the OTS in place. The plan was withdrawn by TVX and the OTS was reclaimed per the Existing Plan in 2000.





# CHAPTER 3 - AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

## INTRODUCTION

This chapter describes the environment that would be affected by the alternatives described in *Chapter 2*. The potential direct, indirect and cumulative impacts of each alternative are discussed for issues identified during scoping and considered to be factors in the decision being made. Additional information on the proposed modifications to the MHM reclamation plan may be found in the project file located in the Montana Department of Environmental Quality (DEQ) office in Helena, MT.

## BACKGROUND

### General Description and History of the Area

The 1986 EIS details the history of the mining operation prior to 1984 (pp. II-103 to II-105). The property passed into public ownership during the fifties, and then returned to private ownership in the mid-sixties. Shortly thereafter, mining interests returned and the property was eventually redeveloped into the modern operation. Operations were placed on a care and maintenance status in 1996, and, following unsuccessful efforts to finance continued development, final closure activities have been initiated.

### Land Status

The operating permit area covers parts of the northeast, northwest and southwest quarters of Section 9 and the southeast quarter of Section 8, Township 9 South, Range 9 East. Property ownership in the Jardine area is presented on Figure 3-1. Mining operations at the MHM were conducted on private land owned by TVX or on patented claims controlled by TVX.

The operating permit boundary is almost entirely contained within the patented land boundaries held by TVX Mineral Hill, Inc (Figure 3-1). No public lands are included within the 69-acre disturbed area.

### Bear Creek

Bear Creek is classified as a "B-1" water of the State. As such, it is suitable for a variety of uses including the propagation of salmonid fishes. However, it is also listed as an impaired stream for aquatic life support and a cold water fishery on the 1996 TMDL list. The probable cause for this impairment is listed as mill tailings and placer mining.

Arsenic is the pollutant of primary concern in Bear Creek. Arsenic has had a maximum reported concentration of 0.041 mg/L. The lowest instream human health water quality standard for arsenic is 0.018 mg/L. The background concentration developed for the MPDES permit was 0.0053 mg/L (DEQ, 1997, Table 1).

Bear Creek surface water quality would be monitored upstream and downstream of the mine site during and for a suitable period after reclamation. Comparisons would be made among results obtained from pre-mining, during-mining, and post-closure periods. In an independent action, the United States Geological Survey (USGS) has conducted a stream tracer study to identify any residual points of ground water discharge to Bear Creek carrying pollutants and to ascertain their quality, quantity, and source (Thamke, J., 2001. Personal communication with J. Gurrieri, DEQ. January 24.).

No sources of pollution were found that could be attributed to the modern TVX mining operations. Diffuse seepage of ground water elevated in arsenic was identified along the entire study reach and was attributed to the natural geochemistry of the area geology. Some elevated arsenic seepage was also found at the historic arsenic mill site, which has been reclaimed by TVX.

## EFFECTS ANALYSIS

The effects of the three alternatives are assessed in the following sections relative to the significant issues identified in *Chapter 2* and *Appendix A*.

### Issue 1. Tailings Storage Facility (TSF) – Biological Treatment System, Cap Design

#### Affected Environment

The TSF is a "dry" tailings deposit with a double liner. The tailings were dewatered to roughly 18-20 percent moisture by weight, then trucked and compacted in place. The compacted tailings mass is stable without the use of a retaining dam. Residual moisture and precipitation percolating through the pile are contained by the double underliner system. These liners serve to isolate the compacted tailings from the environment. The underliner collects percolating seepage and delivers it to the SCP (Figure 1-2).

### *Seepage Quantity*

Since operations ceased in 1996, the seepage from the TSF into the SCP has declined to a baseflow of 3 gpm or less (Figure 3-2). Storm water was collected by the exposed liner and was superimposed on the baseflow as discrete events until the end of 2000. The resulting seepage rate with storm water varied from 2-60 gpm. In the fall of 2000, storm water was diverted off the TSF after an 18-inch layer of alluvial borrow material was placed on the TSF. The clean borrow material was placed over tailings and contaminated soils from the OTS, which were relocated to the TSF in 2000.

### *Seepage Quality*

Water quality monitoring is conducted for ground water, Bear Creek, the SCP, TSF seepage, and RO effluent. Chemistry of the seepage since closure is listed in Table 3-1. Water quality does not meet Montana water quality standards, and treatment is required. The treated water is then discharged to Bear Creek at Outfall 002 under MPDES permit MT-0030252. Outfall 002 established a standard mixing zone of approximately 100 feet in Bear Creek. The water must meet Montana non-degradation requirements.

Since issuance of the modified MPDES permit in 1997, operational TSF seepage has been collected in the SCP. It is pumped via a buried pipeline to the chemical addition building where it is treated by pH adjustment, settling, two-stage high pressure RO chambers, and evaporation, before it is discharged to Bear Creek under the MPDES permit. RO brine is evaporated on site. The treated seepage is higher quality than all applicable water quality standards. TVX maintains a full-time work force of six operators to maintain the water collection, treatment, and discharge system.

### *Soil Erosion*

The tailings contained within the TSF are two-thirds silt sized material. Silt sized material is more susceptible to surface erosion than other particle sizes, yet over the past 10 years, the exposed TSF tailings have exhibited extremely limited sheet, rill, or gully erosion. Several factors may be responsible for this behavior. First, the tailings were compacted, which increases the tractive force required to entrain them. Second, the tailings particles may exhibit greater cohesion and internal friction than natural silt.

During the summer of 2000, the OTS tailings were removed from the OTS and transferred to the TSF, along with the underlying contaminated native soil materials (Figure 1-2). The contaminated soils that were removed had total arsenic concentrations above 100 mg/L. Clean backfill was imported from the TSF

borrow pit to reestablish smooth, free draining contours (Figure 2-3). Twelve inches of soil (9,200 cubic yards from an on-site stockpile and 3,900 cubic yards from the Brogan Pit near Corwin Springs, MT) was placed over the entire 8-acre area. The OTS area was then seeded with the grassland seed mix and, to date, 2000 sagebrush and rabbitbrush seedlings have been planted.

At the same time, the TSF double underliner was extended to the north to create adequate capacity to store the OTS material (Figure 2-2). The underdrain system was expanded over the new underliner, and the OTS material was placed and compacted. The TSF was then regraded to establish the final landform. The north slope was graded between a 6:1 and 4:1 slope, with the lower slope angle at the slope toe in a segmented concave profile (Figure 2-2). Concave slope profiles produce less erosion than straight or convex slope profiles.

Finally, an 18-inch TSF borrow pit subsoil cover was placed over the TSF to minimize erosion and to remove storm water flows. The drainage was diverted off the TSF via a riprapped diversion channel (Figure 2-3). The old borrow pit north of the TSF was backfilled with borrow material from the new borrow area, reestablishing positive drainage through the area (Figure 2-3). No interim seeding occurred on the TSF in fall 2000.

### Existing Plan

#### *Cap Design*

The Existing Plan calls for a two-layer cover, composed of three inches of gravel and 12 inches of soil. The upper nine inches of tailings would be mixed with bentonite clay and compacted (1986, EIS, p. III-4) (Figure 3-3). Clay for the Existing Plan would probably be obtained from suppliers in eastern Wyoming.

The Existing Plan relies on the integrity of a low-permeability, compacted, bentonite-amended, tailings layer. The clay-amended tailings layer would be subject to degradation by frost and desiccation because it is only 15 inches below the surface and within the frost zone. Burial of less than 3 to 6 feet would likely lead to a short service life for the compacted clay layer in the frost zone (Koerner and Daniel, 1997).

Under the Existing Plan, rooting depth would be limited to 15 inches because tailings are unsuitable for plant growth. The old tailings deposits in the area have very little plant growth after many years. The shallow rooting depth would limit plant biomass production relative to a deeper soil. Thus, evapotranspiration would also be less.

The bentonite clay-amended tailings layer would perch soil water, which would have some limited ability to drain laterally to the TSF periphery or be evapotranspired. Saturated conditions would occur more frequently than in a free draining soil, leading to reduced soil strength and increased potential for shallow mass wasting along the soil/clay layer failure plane. Surface runoff following cap placement would become storm water, and would not require treatment unless lateral seeps developed that were contaminated by contact with the water barrier layer constructed out of tailings.

#### *Seepage Quantity*

The 1986 EIS (p. III-9) predicted the reclaimed TSF would produce an unspecified seepage rate following closure. The existing reclamation plan for the TSF allows the seepage to accumulate in the seepage collection pond with no long-term treatment. The 1986 EIS assumed that the seepage would meet water quality standards because of the predicted seepage amount and quality. It has been apparent since November 1999 that the seepage quantity would be measurable following closure. The seepage is currently treated as part of the MPDES permit and this would have to continue under the Existing Plan.

The Ecological Dynamics Simulation (EDYS) model was run for the existing cover system (Table 3-5). For a description of the EDYS model refer to the CCP (AKI, 2000a, Appendix 6, Sub-Appendix C). EDYS modeling of the existing cover design predicted annual average infiltration values for the first 20 years of 0.22 gpm. (Table 3-5). The MPDES permit would have to remain in place until the discharge ceases. Bond for treatment of seepage water was added to the reclamation bond in 1999. The bond was calculated using a conservative 5.0-gpm flow. For more discussion on bonding, see Issue 11-Bond. Detailed bond calculations are available from DEQ in Helena.

No plan is in place for post-closure management of the seepage, SCP overflow, SCP maintenance, or wildlife use.

The effects of root growth and tree fall on the water barrier cap are a concern. Volunteer woody vegetation, including trees, would have to be removed. Therefore, there would be no potential impacts from tree roots destroying the integrity of the clay barrier layer. Refer to Issue 9-Revegetation for a discussion of this concern.

Seepage through the soil cover would preferentially run along the contact with the clay-amended tailings layer downslope and report to diversions. Once the integrity of the compacted clay layer is compromised by frost action and wetting and drying, the seepage through the tailings would increase and report to the SCP and

require treatment. The existing permitted treatment system and discharge to Bear Creek would have to be left in place. Maintenance requirements would be the same as under the existing operational system.

#### *Seepage Quality*

Lateral subsurface flow along the soil/clay layer interface could dissolve metals or other constituents of concern and transport them to the periphery and off of the lined area. This potential contamination pathway was not analyzed in the 1986 EIS.

Site monitoring data show that seepage water does not meet Montana water quality standards (AKI, 2000a) (Table 3-1). It must be presumed that the applicable water quality standards would not be achieved without treatment. The existing monitoring program would have to be maintained.

#### *Soil Erosion*

Rill and gully erosion was not anticipated as a problem. Erosion has not been a problem during operations, even without a soil or plant cover. Reclamation experience at the site on the south face of the TSF has produced acceptable plant communities and controlled sheet, rill and gully erosion. This area is up to 10 years old. Short-term, erosion control, best management practices (BMPs) would be required until vegetation becomes established on the rest of the TSF.

#### Applicant's Proposed Plan

##### *Cap Design*

Ultimately, some volume of long-term residual seepage is expected from the TSF (Table 3-5). Under the Existing Plan, a projected average of 0.22 gpm seepage would drain from the pile. This seepage would be treated and discharged under an MPDES permit. The Applicant's Proposed Plan seeks to reduce seepage by evapotranspiration such that the TSF has zero discharge and the MPDES Outfall 002 can be eliminated. Any overflow during wet-year periods would be land applied at agronomic rates. No discharge would be made to ground water or surface water and a MDPES permit would not be required. The water balance cap in the Applicant's Proposed Plan is 48 inches thick, utilizing a 36-inch sandy gravel alluvial borrow subsoil layer and 12 inches of soil (Figure 3-3). The EDYS computer model was used to assess the seepage quantity of the approved cap versus the proposed alternative (Table 3-5).

An issue raised by the public was that a water balance cap design had been previously evaluated by TVX and found to be ineffective (Maxim Technologies, Inc., 1997). That work suggested that the available alluvial subsoil material is too coarse and would not provide

suitable water retention characteristics. This may have been an artifact of the HELP model used and the model formulation.

The EDYS model has been verified in field studies (McLendon, et al, 1997), and the vegetation growth predicted for the MHM has been verified (Shepherd Miller, Inc., 2001). First growing season data from tailings test plots and the 10-year-old growth on the south slope of the TSF confirm plant biomass predictions. Given these verified predictions of plant growth using the EDYS model, DEQ assumes the predicted seepage rates would also be correct. The verification of the EDYS model imparts greater plausibility to the EDYS predictions than those of the HELP model.

The following factors are important to consider in regard to the 1997 analysis by TVX using the HELP model and the current EDYS modeling (Shepherd Miller, Inc., 2000a).

The 1997 TVX evaluation:

- did not include both a 12-inch soil layer and a 36-inch subsoil layer; only 25 inches of alluvial borrow material was evaluated;
- was based on the more simplistic HELP model with parameters that were either assumed or derived from existing data and site information;
- considered 15 inches of evaporative zone depth in the HELP model;
- included a low-permeability zone ( $10^{-6}$  centimeters per second (cm/sec), which corresponded to the approved bentonite-amended clay barrier layer between the 15-inch cover and the unamended tailings. This model formulation is inconsistent with the 1997 text description;
- assumed lateral drainage to the pile perimeter on the low-permeability layer; and
- assumed a three-month growing season with no plant water use outside this season.

The HELP model is a hydrological model of water movement designed for use with landfills (Schroeder, et al, 1994). The HELP model can be used for preliminary analysis of a cover design concept, followed by more sophisticated hydrological modeling tools, such as SoilCover and SEEP/W, used to conduct specific modeling of alternatives (Unsaturated Soils Group, 1997). SoilCover was used to develop the reclamation cover design for the MHM, followed by EDYS modeling to assess detailed sensitivity study scenarios. The SoilCover and EDYS model results were consistent with each other, predicting roughly 0.3 and 0.2 gpm, respectively (AKI, 2000a, Appendix 6, Sub-Appendix C).

The EDYS model analysis differs from the 1997 work due to the following factors:

- The EDYS analysis is based on field and laboratory testing of the existing materials, including tailings permeability;
- The proposed cover includes 12 inches of soil and 36 inches of alluvial borrow on a compacted tailings surface;
- The temporary water storage capacity of the cover materials and upper tailings materials are accounted for in the EDYS modeling;
- Field research by experts who applied the EDYS model, predict root penetration down to and into the tailings, so that 48 inches or more of material is available for water retention and subsequent removal by plant uptake. Under a grass community, the average seepage rate below the roots over the 200-year simulation, is projected to be 0.253 and 0.254 gpm with and without rooting into the tailings, respectively (Shepherd Miller, Inc., 2001). The Douglas fir forest would result in much less drainage;
- The deeply rooted vegetation would continue to utilize water beyond the three-month growing season assumed in the 1997 work;
- The EDYS model is a process-oriented model with verified accuracy; and
- Lateral drainage would be insignificant relative to vertical percolation because the bentonite-amended compacted clay layer would be eliminated.

The above factors illustrate why the more recent EDYS work resulted in a different seepage rate.

The proposed 48-inch water balance cover does not rely on lateral drainage and the integrity of a low-permeability, compacted, bentonite-amended tailings layer. The clay-amended layer in the existing water barrier plan would be subject to degradation by frost and desiccation damage such that seepage predictions in Table 3-5 represent best case conditions; i.e., they would increase as the clay layer degrades and lateral drainage decreases. In contrast, for the Applicant's Proposed Plan, the values in Table 3-5 are conservative estimates; i.e., as vegetation grows vertical drainage would decrease.

The 48-inch proposed water balance cap would provide a greater depth of rooting before the tailings are contacted, but if and when roots do penetrate to the tailings, roots do not compromise the cap function. The deeper the roots penetrate, the deeper the zone from which water can be removed, and the more efficient the cap.

Douglas fir would be planted on the proposed cap. The large biomass of the trees would eventually use more water than grass alone (Table 3-2). Trees would be removed in the Existing Plan to limit root damage to the approved 15-inch water barrier cap, while the thicker 48-inch water balance cap would evapotranspire more water with continued plant growth. The greater the biomass, the more water that can be used, rather than percolate downward to become seepage.

Should a tree blow down a root wad divot would be created. Impacts from moisture accumulating in the hole would be increased. The 48-inch soil and sandy gravel subsoil layer would repair itself to some degree. DEQ does not believe the impacts would result in significantly greater seepage rates on the whole from the TSF, but bond has been calculated to maintain the water treatment systems for 100 years.

DEQ believes dominance of a Douglas fir community over the long term on the TSF, because of its higher water use efficiency, would reduce the amount of seepage through the TSF over the grassland dominated community in the Existing Plan (Table 3-2).

Stockpiled TSF soil quality is shown in Table 3-3. The soil has a sandy loam texture and a coarse rock fragment (>2mm) content of less than 30 percent. The soil has a much higher inherent water-holding capacity than the subsoil used in the HELP model evaluation in 1997.

All alluvial materials to be used as subsoil for the proposed cap can be obtained from the borrow area located adjacent to the existing borrow pit at the north end of the TSF (Figure 2-3). Characteristics of the subsoil are listed in Table 3-4. The subsoil has a sandy loam texture and coarse rock fragment content (>2mm) of roughly 50 percent. It has a much lower inherent water-holding capacity than the proposed 12-inch soil layer.

Through use of computer simulation, various scenarios of wet/dry years, overgrazing by elk and other ungulates, high runoff effects on soil erosion, and fire have been assessed for the approved and proposed caps. Available paleo-climatic research shows that during the past 5000 years, the total annual precipitation has varied by roughly 3-10 percent of present values (Poage, et al, 1999). Seasonality has changed with hotter summers and colder winters occurring in the past, but rainfall depth fluctuations are well within the 125 percent of current amounts that were modeled. Thus, the predictions based on 125 percent of current precipitation are conservative.

The highest rates of infiltration occur in the first 20 years as vegetation is becoming established (AKI, 2000a, Appendix 6, Sub-Appendix C). Under the

current rainfall regime, when the TSF is planted to grass understory and a Douglas fir canopy, average annual infiltration below the rooting zone is predicted to be 0.14 gpm over the first 20 years (Table 3-5). The peak annual average infiltration rate during that 20-year period is 0.78 gpm. The average infiltration rate decreases below 0.1 gpm in subsequent decades. Best results were obtained for planting Douglas fir or big sagebrush seedlings in addition to grass seeding.

#### *Soil Erosion*

EDYS modeling was performed to predict effects of fire and overgrazing by elk. These had a nominal effect on infiltration below the rooting zone, and they are not considered significant problems for water balance cap function over the long term.

Soil erosion and rill formation were modeled on a detailed scale (AKI, 2000a). EDYS modeling predicts a very low erosion rate following placement of the soil cover and establishment of revegetation. Based on experience with the site in an unreclaimed condition, this prediction is reasonable.

Sheet flow is forecast to predominate on the distributive TSF landform. The small upslope contributing area (top of the TSF) and apparent cohesion imparted to the soil by the growing vegetation, limit the generation of rills or gullies. Predicted soil loss is on the order of millimeters over the 200-year simulation period.

These predictions are supported by observation of the unreclaimed TSF, which has not developed extensive rilling or gullying during at least seven years of exposure. The coarse fragment content of the replacement soil is less than the rock content of the subsoil increasing the potential for short-term erosion over the Existing Plan (Tables 3-3 and 3-4). But because of the shallow slopes and limited slope lengths on the TSF there would be no difference in effect on soil erosion between the Existing Plan and Applicant's Proposed Plan. As in the Existing Plan, short-term, erosion control BMPs would be required.

#### *Stability*

No stability problems were identified for the water balance cap because less water would percolate to the subsoil/tailings contact, so there would be less chance for shallow slumping of the cap. The only stability problems would be the formation of root wad divots when a mature Douglas fir would blow down. This would be a localized event.

#### *Seepage Quantity*

Almost all TSF percolation below the rooting zone in the water balance cap would occur during spring snow melt and following summer thunderstorms. No



measurable water would percolate into the pile during the fall and winter months. Thus, the effluent flow to the biological treatment system during winter would be negligible, and the chances of water getting through the rooting zone when the plants are dormant are reduced.

#### *Seepage Quality*

To treat seepage from the TSF, TVX has proposed a two-stage biological treatment system. The first-stage would treat tailings effluent in a series of four biological vaults designed to achieve Montana aquatic life and human health water quality standards (AKI, 2000a, CCP, Appendix C) with the exception of manganese, sulfate, arsenic, and TDS (Figure 3-4). Effluent from the four-vault biological treatment system would report to the second-stage wet meadow HDS.

This half-acre wet meadow HDS would be constructed within the SCP (Figure 2-6). The existing double HDPE liner in the SCP would be retained, and an additional geotextile clay liner (GCL) would be installed in order to maintain a high water table. The bentonite clay layer in the GCL would be protected from frost action and the effects of desiccation by burial at a depth of roughly 8 feet.

Shepherd Miller, Inc. (2000a) has tested a bench scale biological treatment system consisting of a four-step process including: 1) pH buffering, 2) aerobic treatment, 3) anaerobic treatment, and 4) aerobic polishing steps (Figure 2-6). Each step would be housed in a separate buried pre-cast concrete vault.

Aerobic conditions would be induced by sparging compressed air, while anaerobic conditions would be induced by promoting bacterial oxygen consumption within the sealed vaults. Buried concrete vaults and compressed air would allow aerobic or anaerobic conditions to be maintained throughout the year, independent of atmospheric conditions.

First-step alkalinity addition would buffer any potential acid generated in the pile. First- and second-step test columns exhibited reddish orange coatings characteristic of iron hydroxides. The first two steps removed 50-60 percent of incoming iron (Shepherd Miller, Inc., 2001).

The anaerobic treatment step is dependent on a carbon source as food for the bacteria. Carbon is consumed through the reduction of sulfate into sulfide that combines with available metal ions to form insoluble metal sulfide compounds. The carbon source to feed the anaerobic bacteria would be provided in liquid form, such as alcohol or sugar, metered into the reactor. The readily metabolized alcohol and sugar would maintain the anaerobic reaction. Solid carbon sources, such as horse manure, wood chips, or hay, would have

finite life spans and require periodic replacement (Figure 3-5).

The use of solid carbon sources has also introduced other sources of metal contamination in biological treatment systems at other mines in Montana. This has been a problem at the CR Kendall Mine near Lewistown and is occurring at a pilot scale plant at the Basin Creek Mine near Helena, MT. Through the use of the liquid carbon feed, the biological treatment system would be more likely to continue to perform into the indefinite future with less maintenance than with solid carbon sources.

Heavy black precipitates, indicative of metal sulfide precipitation, characterized the third-step test column. The fourth-step test column had metal sulfides deposited at the influent end. Some manganese appears to have dissolved from the limestone media, and a manganese-free source would be sought for the prototype (Shepherd Miller, Inc., 2001).

The proposed biological treatment system is a low-maintenance means of achieving a discharge that approaches state water quality standards. Arsenic in the effluent would be less than 0.1 mg/L, and would still exceed the ground water standard of 0.036mg/L (Figure 3-4).

Based on EDYS modeling, total evapotranspiration in the SCP is projected at 469,000 gallons per year, which is equivalent to 0.9 gpm annually. Over a four-month growing season, the evapotranspiration rate is projected to be 2.7 gpm. This would result in total utilization of the seepage effluent from the TSF during that four-month period.

During a once in 20-year heavy precipitation cycle, the wet meadow HDS evapotranspiration capacity may be over taxed. Overflow from the wet meadow HDS would passively flow to a sump which is automatically controlled to pump to an upland HDS (Figures 2-5 and 2-6). The upland HDS is a drainfield with both shallow and deep drip emitter tubes, which can be employed by the operator as desired. The EDYS model predicts 110,000 gallons of treated effluent and direct precipitation on the wet meadow HDS would be pumped to the upland HDS during the 20-year wet cycle (29 percent precipitation, 71 percent effluent). This equates to 0.85 gpm over a three-month period.

TVX has developed a contingency option to ensure TSF seepage would meet ground water standards in the upland HDS (Figure 1, *Appendix D*). A 1.7-acre upland HDS would use that water at a 10:1 dilution with up to 15 gpm of Creville Adit water (860,000 gallons total). To remain conservative, the upland HDS would be sized at 2.0 acres. A greater biomass of vegetation would develop because of the treated effluent water



available at the wet meadow and upland HDS sites. As vegetation biomass increases, the system would become more efficient. The option exists to add up to 15 gpm of clean Crevice Adit water to the upland HDS to enhance vegetation biomass in dry years.

Prior to application to the upland HDS, the treated water would meet applicable water quality standards after dilution with 15 gpm of Crevice Adit water (Figure 3-4). This would be verified by monitoring (Issue 5) (AKI, 2000a). By applying water that meets ground water quality standards, there would be no effect on ground water quality. Monitoring would be conducted on ground water and the TSF seepage rate before entering the first-stage biological treatment system and effluent out of the fourth vault before entering the wet meadow HDS.

The water applied to the upland HDS would not require a MPDES permit outfall.

Maintenance would be required for the upland HDS pipeline and pump. However, the Applicant's Proposed Plan would include a smaller, lower head pump than the existing pump being used to comply with the MPDES permit. The biological treatment system would require periodic maintenance. Refer to Issue 11-Bond for a discussion of monitoring and maintenance costs.

#### Agency Modified Plan

TVX and DEQ have developed two modifications to the Applicant's Proposed Plan have been developed for the disposal of TSF seepage in the event that the biological treatment system is down for repairs or maintenance. The first contingency plan is similar to the TVX option but would add as much of the excess 184 gpm of Crevice Adit water as needed to the TSF seepage to meet ground water standards. The TSF seepage would be pumped from the wet meadow HDS to the upland HDS system above the TSF. The effluent would be mixed with Crevice Adit water in the mix box as necessary to meet Montana WQB-7 ground water arsenic criterion of 0.02 mg/L prior to discharge (Figure 1, Option A, *Appendix D*). DEQ would require monitoring at the upland HDS site after the addition of Crevice Adit water prior to application to the upland HDS.

The second modification to the Applicant's Proposed Plan developed by TVX and DEQ would require mixing of up to 200 gpm of Crevice Adit water with the TSF effluent in the wet meadow HDS. The subsequent overflow water would be discharged by gravity to Bear Creek via an existing ephemeral drainage (Figure 1, Option B, *Appendix D*). No pipeline would be constructed through the drainage to Bear Creek. The existing vegetated ephemeral drainage would be capable of transporting this optional flow with minimal erosion. If ever used, this contingency would require a new

MPDES Outfall 006 but existing effluent limits, developed for Outfall 001, could be met and the outfall would be permissible under the MPDES rules (*Appendix C*).

The overall affect of reclamation and the issuance of the revised MPDES permit would be to decrease the load of pollutants to Bear Creek. The original permit allowed a load of 0.0032 pounds/day (lb/day) from Outfall 002. The new permit allows the same discharge of 0.0032 lb/day from Outfall 002, but the Applicant's Proposed Plan would only require the need for the outfall for two years at which time, all seepage would report to the HDS. This would result in a reduction of approximately 100 percent of TSF seepage reporting to Bear Creek.

#### Cumulative Effects

The geologic deposits, soil and water resources in the MHM area have naturally elevated levels of metals, especially arsenic (Thamke, J., 2001. Personal communication with J. Gurrieri, DEQ, January 24). By applying treated TSF seepage water to the upland HDS, which has been mixed with Crevice Adit water to meet applicable ground water quality standards, there would be no local or cumulative impact on the environment.

Bond would be in place to monitor and maintain the TSF reclamation cover, seepage collection facilities and two HDS sites. No other impacts to the area are proposed that could increase pollutant loads. If the USFS assumes management at closure, any future development would have to conform to the Gallatin National Forest Management Plan. TVX and DEQ have developed three contingencies to ensure surface and ground water quality is achieved even if the proposed treatment system is down for repairs or maintenance.

### **Issue 3. Crevice Adit Water System Design**

#### Affected Environment

The reclamation plan for the Crevice Adit was approved in 1996 under Exploration License 00559 (DSL, 1994). A significant amount of water (up to 1,500 gpm) was encountered during construction of the adit. MPDES permit MT-0030252 was obtained as a result of an enforcement action on the discharge of the flow to Bear Creek. The adit continues to drain via a HDPE surface pipeline. The discharge rate is now less than 400 gpm, as the bedrock formation is dewatered. Most of the water is produced from dewatering drill holes; the rest is produced from seepage into the adit. The Crevice Adit water is of high quality and requires no treatment prior to discharge. Montana non-degradation criteria do not apply to the discharge because it meets standards. The surface pipeline is routinely inspected for leaks.

The 1996 MPDES permit allowed 1,300 gpm to be discharged at Outfall 001 to Bear Creek. This 1,300 gpm flow was a mixture of the Crevice Adit water and the 1300 Adit discharge from Outfall 003 (DEQ, 1997).

In the 1996 MPDES permit, water quality limits for arsenic in the Crevice Adit water were set at 0.005 mg/L. The Crevice Adit added a total of 0.07 pounds per day (lb/day) of arsenic to Bear Creek (DEQ, 1997). No water quality violations have been reported since April 1, 1996 the date of the original MPDES permit issuance.

Parameters that were included in the 1996 and 1997 MPDES permit included total dissolved solids (TDS), cadmium, copper, iron, manganese, lead, zinc, mercury, arsenic, and total nitrogen. In the past 96 weeks of sampling, during which water flows have continued to decline and closure of the mine site has advanced, no concentrations above detection limits have been reported for lead or mercury. There was only one detection of copper and eleven detections of cadmium (*Appendix C*).

In 1998, one of the Crevice Adit drill holes was completed and permitted as a water supply well for the Jardine Historic District. The well feeds a 50,000-gallon surface storage tank, which supplies both potable and fire suppression storage needs (Figure 2-6). The Crevice Adit well is artesian. It produces roughly 50 gpm, which drains via a surface HDPE pipeline. The surface pipeline is routinely inspected for leaks.

#### Existing Plan

The Existing Plan includes an adit plug of unspecified design to be installed in the Crevice Adit, if water was encountered. The applicant has submitted preliminary designs for a hydraulic concrete plug because of the amount of flow encountered during exploration. It would be expensive (approximately \$250,000) to install, has a long but finite life and would require eventual replacement, would require maintenance of drain holes, and water would eventually seep around the plug.

Concrete adit plugging is proven technology, but there is no accepted method of predicting the structural life of the plug. Many adit plugs exist worldwide, but maintenance and cost are poorly documented. Significant overdesign would be prudent. DEQ would require replacement bond in the event of structural or hydraulic failure. Current bond held by DEQ, for adit plugging is \$56,000.

The concrete plug would back up water in the adit and reestablish the pre-mining hydrologic regime. No reductions to Palmer Creek flow have been documented since the Crevice Adit encountered water. There would be no direct hydrologic connection to the MHM

workings, and it is not expected that seepage from the workings would increase. After equilibrium is reached, whatever reductions in Palmer Creek flow that have resulted from driving the adit, if any, would be reversed. Any flow from the adit around the plug or from other sources out of Crevice Mountain is expected to meet surface water quality standards.

After the plug is in place, flow out of the adit would decrease to a minimal amount that would either percolate into fractured rock or would be land applied to the surface. No monitoring is proposed for the adit flow around the plug. An MPDES permit may not be required if flows are minimal. Plugging of the Crevice Adit would reduce 0.07 lb/day of arsenic in Bear Creek, which is a 100 percent reduction from the current operational conditions.

The Jardine Historic District Crevice Adit potable supply well would be abandoned. The Pine Creek system or other water supply source would have to be developed for future use of the Jardine Historic District. Both surface pipelines would be removed and disturbances would be reclaimed.

#### Applicant's Proposed Plan

Under the proposed plan, the dewatering drill holes would be plugged, but not the adit itself. Drill hole plugging would consist of setting an inflatable packer inside the hole and grouting the hole to the collar with concrete.

Adit discharge has been monitored for several years, and is composed of seepage to the adit and drill hole drainage (unpublished data, TVX). Based on this data, plugging the drill holes would reduce the August 2000 average adit drainage rate of 354 gpm to roughly 128 gpm. On a nominal basis for design purposes, 150 gpm has been used. This 150 gpm does not include the 50-gpm-artesian well used for the Jardine water supply. Drill hole plugging is a proven technology, and can be expected to limit the flow of water as long as the packer and grout material maintain integrity. State-of-the-art packing materials and 30 feet of grout would be utilized. Adit water quality is such that it would not significantly degrade these materials.

The remaining adit drainage of up to 150 gpm would continue to be routed by gravity to Bear Creek for discharge under a revised MPDES permit Outfall 001 (Figure 2-6). The flow from the 1300 Adit would be eliminated from the revised Outfall 001, significantly reducing pollutant loads to Bear Creek. Figure 3-6 illustrates the difference in permitted pollutant loads at Outfall 001 in 1997 compared to the revised MPDES permit that would be issued in 2001 (*Appendix C*).

TVX believes that the Crevice Adit would reach a steady state where discharge would equal recharge (nominally 200 gpm). Flow would be monitored under the revised MPDES permit.

The Crevice Adit has been open since 1995, and no noticeable reductions in Palmer Creek flow have been documented. Reducing the flow from the adit to a steady state of 200 gpm by plugging drill holes, would reduce the dewatering rate, and could prevent complete dewatering of Crevice Mountain and potential reductions in Palmer Creek flow.

Access to the Crevice Adit would be controlled through construction of a bulkhead with an integral locking steel door. The bulkhead would not be constructed as a water-retaining structure, but rather as a security measure and would be designed for bat access. For more information on bat access, see Issue 18.

Given that the applicant intends to donate the Jardine Historic District and surrounding patented lands to the USFS for management as part of the Gallatin National Forest, a continued water supply and fire protection for Jardine would be a desirable feature for the post-mine land use. Maintenance of the Crevice Adit ground water supply is a technically feasible plan that would make use of available infrastructure. The current surface piping system would be upgraded by burying the pipe below the frost line (six feet deep), and converting the entire system to a gravity-driven system. This would reduce the existing monitoring and maintenance requirements.

Maintaining a discharge to Bear Creek would place a minimal burden on the USFS, if it receives the property. The system would be gravity fed and the pipeline would be buried SDR-11 HDPE, a very low-maintenance, high-density plastic. Pipelines would be built to municipal water system standards ensuring a long life span. TVX would pressure test all pipelines to ensure they are not leaking after construction. Access to the adit would be prevented by the installation of a steel door designed for bat access, reducing long-term human safety concerns post-closure.

Water quality is excellent, and no treatment would be required to maintain compliance with the MPDES permit. Water quality monitoring is required by the MPDES permit and by the Public Water Supply permit for the Jardine potable water system. The revised MPDES for the Applicant's Proposed Plan with reduced flows from the Crevice Adit would reduce the amount of arsenic reporting to Bear Creek to 0.01 lb/day. This is an 84 percent reduction from the permitted operational conditions.

If TVX keeps the property, the only bond needed would be for operation and maintenance of the pipelines over

100 years. If the USFS takes over the property, they would be responsible for replacing the pipelines as needed in the future.

TVX has developed two contingency options that use the clean Crevice Adit water to prevent water quality problems with the TSF seepage (Issue 1 and Figure 1, *Appendix D*) and 1300 Adit water (Issue 4 and *Appendix D*).

#### Agency Modified Plan

The proposed Crevice Adit water management system would not require a contingency water treatment plan since it meets water quality standards. Bond would be held for operation and maintenance of the pipelines for 100 years (Issue 11). DEQ would require the applicant to utilize Crevice Adit water as necessary in other contingency options that may be needed for treatment of discharge from the TSF and the 1300 Adit (Issue 1 and 4 and *Appendix C* and *D*).

DEQ would require the applicant to submit final design drawings for the piping systems for review and approval. The USFS would review the final designs to ensure adequacy and compliance with the Forest Plan.

#### Cumulative Effects

The flow from the Crevice Adit since 1994 has minimized the impact of flow reductions due to climatic changes in Bear Creek. The adit continues to dewater Crevice Mountain so flows are declining. If the adit continues to drain unchecked, the flow could reduce to a much smaller number of gallons per minute. In the Applicant's Proposed Plan, TVX predicts that plugging the Crevice Adit drill holes would reduce the volume of adit drainage to a long-term steady state estimated at 200 gpm. This volume of excellent quality water (TVX, 1997-2000, MPDES data monitoring reports) would continue to increase the flow in Bear Creek at a steady state throughout the year. The Existing Plan would plug the Crevice Adit and would eliminate the flow to Bear Creek.

The only other potential cumulative impact to Bear Creek would be the proposed Darroch-Eagle Creek timber sale. These impacts are predicted to be minor (USFS, 1999).

#### **Issue 4. 1300 Adit Drainage**

##### Affected Environment

1300 Adit drainage pre-dates Operating Permit 00100. Under the existing reclamation plan and the 1986 EIS, this discharge was not considered for treatment as part of the closure plan. TVX is required under the Montana Water Quality Act to treat 1300 Adit water to

water quality standards prior to discharge. The discharge does not have to meet Montana non-degradation criteria. No bond is currently held for 1300 Adit water treatment.

The 1300 Adit has collapsed as a result of natural processes and no use of this mining level was made under Operating Permit 00100. The 1300 Adit does drain the upper portions of the mine that were impacted under Operating Permit 00100. Although the adit itself was not impacted by modern operations, the water draining is influenced by modern upper level activities. The adit currently flows at a rate of 10-15 gpm (Figure 2-12). Only arsenic exceeds ground water quality standards (Table 3-6).

In 1996, DEQ required the 1300 Adit discharge to be regulated as a mine discharge under the MPDES program because of the influence imposed on the drainage by modern operations. The MPDES allows the current 15-gpm flow from the 1300 Adit Outfall 003 to be mixed with the current 354 gpm flow of Crevice Adit water and discharged at Outfall 001 in Bear Creek. The discharge meets surface water standards at that point. The 1300 Adit discharge is currently routed via a gravity surface pipeline to the Crevice Adit surface pipeline prior to the Outfall 001 point. The MPDES permit requires monitoring of flow and quality (DEQ, 1997).

The original Outfall 003 was permitted to discharge 50 gpm of 1300 Adit water containing up to 1.0 mg/L arsenic to Bear Creek. Parameters included in the 1996-1997 MPDES permit for Outfall 003 included TDS, cadmium, copper, lead, zinc and mercury. Arsenic concentrations have remained high in this discharge (0.5-0.6 mg/L). The original MPDES permit allowed 0.56 lb/day of arsenic. The last 10 months of data (10 samples) show no detection of lead or mercury and only one detection of cadmium at Outfall 003.

#### Existing Plan

The existing reclamation plan does not contemplate treating the 15-gpm 1300 Adit discharge. If the Crevice Adit were plugged, the MPDES permit would have to be revised to deal with the arsenic in the 1300 Adit discharge independent of the Crevice Adit discharge (Appendix C). The current 354 gpm of Crevice Adit water would be unavailable due to adit plugging. A treatment system and maintenance program would have to be developed for the 1300 Adit discharge to comply with MPDES permit requirements. Monitoring of flow and quality in the MPDES permit would have to be revised as well.

No bond currently exists for treatment and maintenance costs for the 1300 Adit discharge. The MPDES permit does not require bonds. The Existing Plan would have

to be revised if the Crevice Adit is plugged. A bond would have to be developed for the 1300 Adit discharge treatment plan.

#### Applicant's Proposed Plan

Water discharging from the historic 1300 Adit has decreased in volume from approximately 50 gpm to 15 gpm. The 1300 Adit would be closed as shown in Figure 2-7. The 1300 Adit water would be collected and treated by chemical coprecipitation with ferric sulfate (Figure 2-8), settling, and discharge in the Jardine community septic system and two existing drainfields (Figures 2-9, 2-10 and 2-11). Settling would take place in an existing 5,000-gallon septic tank followed by an additional 5,000-gallon dosing tank. Compliance sampling has not been proposed prior to discharge to the drainfield. The drainfields were constructed in 1989 and 1996 and were designed to serve a population of 200 (Appendix C).

Dissolved arsenic would be reduced below all applicable water quality criteria by chemical precipitation and settling to less than 0.02 mg/L based on a full scale pilot test conducted by TVX (AKI, 2000b). DEQ calculated the applicable ground water standard based on background arsenic concentrations at 0.036 mg/L. The revised MPDES permit and appropriate UIC authorization would determine flow and water quality limits and monitoring requirements (for the revised MPDES limits, see Appendix C). The revised MPDES permit would identify a new Outfall 005 at the septic tank. The permit would allow a ground water discharge of 0.009 lb/day of arsenic to ground water. This is a 100 percent reduction of arsenic reporting to Bear Creek when compared to the operational conditions.

The application for authorization of an UIC permit has been submitted to EPA. No response has been received as of the date of this EIS.

The chemical precipitation system and pipeline would be operated indefinitely and require ongoing maintenance. There is a chance that arsenic levels could be exceeded periodically because monitoring is not proposed after mixing occurs to verify results. TVX has developed a contingency option that would mix 10-20 gpm of clean Crevice Adit water with the 1300 Adit effluent in the dosing tank before discharge to the drainfields (Figure 1, Appendix D). This would help ensure that the effluent would meet ground water standards before being discharged.

Under both the Existing Plan and the Applicant's Proposed Plan, if TVX keeps the property, there is a bonding requirement. They have to operate, maintain, and replace components of the chemical addition building periodically over the years to maintain

compliance with the MPDES and UIC permits. If the USFS takes over the property, these responsibilities would fall to the USFS.

#### Agency Modified Plan

DEQ would require submittal of design drawings for the proposed chemical addition building and pipelines for review and approval. An additional water quality monitoring station would be required to monitor the effluent from the chemical addition building after the ferric sulfate addition and mixing to ensure the treated water meets ground water quality standards before it enters the drainfield. Monitoring would be required 12 times per year in the dosing tank. There is a possibility that arsenic levels could be exceeded periodically between sampling events. This is not very likely as the flow and quality are relatively stable and the treatment technology is straightforward (Table 3-6).

The preferred alternative for the discharge of 1300 Adit water would be through treatment and discharge to ground water at Outfall 005 rather than at Outfall 003 to Bear Creek. TVX and DEQ have developed two contingency options if the treatment system would be down for repairs or replacement. More Crevice Adit water (up to 190 gpm) would be mixed with the 1300 Adit water prior to discharge to ground water. This contingency could be permitted under the MPDES rules (Figure 1, Option C, *Appendix C*).

The other contingency was developed in case the ferric sulfate coprecipitation system was down for maintenance or repairs. The existing 1300 Adit discharge pipeline to Bear Creek via the Crevice Adit pipeline would be buried and used as a contingency. Outfalls 003 and 001 would be used in case this contingency was needed (Figure 1, Option D, *Appendix D*). This mixing of Crevice Adit and 1300 Adit water as is done today would ensure that water quality violations do not occur.

There is no provision for long-term monitoring and disposal of septic tank sludge from the tank in the Applicant's Proposed Plan. The coprecipitation with ferric sulfate does not produce a large amount of sludge like a lime precipitation process for other heavy metals. Therefore, DEQ does not expect the septic tank would require more than the regular pumping schedule.

#### Cumulative Effects

Treatment of the 1300 Adit water by chemical coprecipitation would reduce arsenic levels in the discharge from an average concentration of 0.506 mg/L (Table 3-6) to below the background arsenic concentration of 0.036 mg/L. Effluent from the chemical coprecipitation system is anticipated to contain less than 0.02 mg/L arsenic.

The original MPDES permit issued in 1996 was based on a combined flow from all three outfalls (1300 Adit, Crevice Adit, and TSF seepage) of 1,350 gpm to Bear Creek. The three sources of flow were permitted to add 0.6322 lb/day of arsenic to Bear Creek (DEQ, 1997). The overall affect of reclamation and the issuance of the revised MPDES permit would significantly decrease the load of pollutants to Bear Creek as illustrated at Outfall 001 in Figure 3-6 (*Appendix C*).

Fifty gpm of the 1996 permitted flow was from the TSF treatment system, discharged at Outfall 002. This treated flow had to meet non-degradation limits. The present treatment system only treats approximately 5.0 gpm of TSF seepage, which is batch-treated when necessary. This is a large reduction in the overall load being discharged. The revised MPDES permit would completely eliminate a discharge to Bear Creek from the TSF after 2002.

Similarly, the discharge from the Crevice Adit would be reduced by 1,100 gpm to a maximum of 200 gpm. Non-degradation does not apply for Crevice Adit water. The concentrations in this water have not increased from the original MPDES permit. The MPDES permit limits have remained the same as in the previous permit, but the flow reductions alone would decrease the pollutant load by approximately 85 percent.

The volume of discharge from the 1300 Adit (Outfall 003) has also decreased from 50 gpm to 15 gpm with a corresponding decrease in load of 70 percent. This water would be discharged to ground water in the existing septic system drainfields in a new Outfall 005 where additional dilution and attenuation would take place prior to entering surface water. Under the revised MPDES permit for the Applicant's Proposed Plan only 0.1 lb/day of arsenic would report to Bear Creek. This is a reduction of over 94 percent of the arsenic currently permitted to report to Bear Creek in operational conditions.

The original permit allowed a load of 0.629 lb/day of arsenic from the combined Outfall 001 and 003 plus 0.0032 lb/day from Outfall 002. The new MPDES permit would allow a discharge of 0.01 lb/day of arsenic from Outfall 001, 0.009 lb/day from Outfall 003 and 0.032 lb/day from Outfall 002. This is a reduction of approximately 0.578 lb/day of arsenic allowed to be discharged from the site or 92 percent.

No other disturbance would occur on Mineral Hill that would influence the long-term water quality of the 1300 Adit discharge. The flow and quality have remained stable for the last two years. The proposed Darroch-Eagle timber sale would have no effect on 1300 Adit discharge but has some minor chance of influencing Bear Creek water quality (USFS, 1999).



## Issue 5. Long-Term Monitoring and Maintenance

### Affected Environment

The MHM area has been impacted by mining operations intermittently since 1870. Operations permitted under Operating Permit 00100 and the associated MEPA documents, including the 1986 EIS, started in 1989. A comprehensive network of monitoring is required by the operating permit, including 23 ground water wells, three stations on Bear Creek, two process water stations (four additional process water stations were discontinued in 1999 with reclamation of the process ponds), and the 1300 Adit (Maxim Technologies, Inc., 2000b).

Monitoring is also required for ground movement at the TSF. A group of land monuments is resurveyed on a quarterly basis by a licensed land surveyor. Any potential changes in monument location or elevation are ascertained to exacting standards. No ground movement has been observed.

In 1996 and 1997, MPDES permit MT-0030252 was issued for the site discharges. Monitoring is included for the three discharges: Outfall 001- Crevice Adit, Outfall 002- RO treatment plant TSF effluent, and Outfall 003- 1300 Adit (internal discharge combined with Crevice Adit flows which is discharged at Outfall 001 to Bear Creek). Bear Creek is sampled upstream and downstream of the Outfall 001 and 002 combined discharge point. As a component of the MPDES permit, a group of wells was installed in a reclaimed area of old tailings called the old tailings north (OTN) to monitor for water surface elevation and ground water quality (Figure 1-2). See Issue 16 for a discussion of ground water impacts.

A MPDES storm water permit was issued for industrial activities in July 1997, and reauthorized in July 1999. That permit required preparation of a storm water pollution prevention plan (SWPPP), associated monitoring of storm water discharged to Bear Creek, and installation and monitoring of best management practices (BMPs) to control erosion. BMPs have successfully contained eroded sediments from disturbed areas on site, and no storm water discharges to Bear Creek have been observed.

Prior to issuance of Operating Permit 00100, the USGS maintained a gaging station on Bear Creek (station 06189500) from 1946 through 1949. No other environmental monitoring was conducted prior to Operating Permit 00100.

Revegetation monitoring for total revegetation canopy cover on the reclaimed OTN site was conducted as a requirement of the construction MPDES storm water permit MTR-100330. DEQ has established guidance

for determining final stabilization for terminating SWPPP coverage under the general storm water permit effective September 22, 1994. Four 100-foot transects were measured at 1-foot increments for the presence of 1) vegetation, 2) litter, or 3) bare soil. The percentage of each occurrence of vegetation and litter determines canopy cover. In accordance with that permit, greater than 80 percent total canopy cover was documented prior to termination of the permit in 1999.

Monitoring is required for noxious weeds under the Park County approved noxious weed control plan and the operating permit. As part of the noxious weed control program, the mine site, and especially reclaimed areas, is surveyed for noxious weeds during the growing season. This monitoring is ongoing.

Monitoring is also required for wildlife observations. Wildlife monitoring has been conducted over the life of Operating Permit 00100. Wildlife sightings are recorded on observation sheets and summarized in an annual report to DEQ. No observations to determine bat use of active or historic workings have been conducted during the operation or care-and-maintenance periods, although a bat survey was conducted of the First Chance Portal prior to initiating rehabilitation work in 2000.

Site maintenance activities under care-and-maintenance status consist of inspections and routine upkeep. The Crevice Adit is inspected daily for ground control conditions; i.e., access, and operation of the drainage pumps. The 1300 Adit is also inspected daily for discharge rate, and any needed repairs. The RO TSF seepage treatment plant is operated and maintained on a 10-hour per day 5-day per week schedule. Other site equipment and facilities are inspected on various schedules, as required for function, safety, and regulatory requirements.

The Jardine Historic District water supply system is inspected daily because of pumping requirements, and repaired as needed. No other monitoring or maintenance of the Jardine Historic District occurs.

### Existing Plan

The Affected Environment section above summarizes the ongoing monitoring and maintenance currently conducted as part of the Existing Plan. In the Existing Plan, long-term monitoring and maintenance of the reclaimed site is not detailed. Other existing permits, such as the MPDES, Public Water Supply, and storm water permits and associated SWPPP, specify compliance hydrologic monitoring (i.e. surface water, ground water, process water, and storm water).

Under the Existing Plan, there is no projection of certainty as to the time or measures required to achieve

water quality standards. Hydrologic monitoring would be conducted for 5 years as specified in the current bond.

TVX would measure vegetation species composition and above ground biomass on the reclaimed TSF annually for 5 years as specified in the 1986 EIS (p. I-18). This revegetation monitoring is not currently bonded.

No specific noxious weed monitoring is contemplated.

Long-term maintenance of reclamation features is not addressed in detail. The Crevice Adit would be plugged, but no plan exists for monitoring or maintenance. Reclamation and associated monitoring and maintenance of the 1300 Adit discharge were not contemplated. The MPDES permit would have to be modified, and continued compliance would be required, along with associated maintenance activities. TSF seepage treatment would continue to be regulated through the existing MPDES permit via the existing RO treatment plant. No long-term plan was considered for TSF seepage treatment under the operating permit. If the Existing Plan is selected, a treatment plan would have to be developed and bonded.

#### Applicant's Proposed Plan

The MPDES requires monitoring for as long as the permit is in effect. MPDES permits are renewed every 5 years. The applicant has filed a permit modification for the MPDES permit that would affect compliance monitoring (AKI, 2000b). The RO treatment plant Outfall 002 would be decommissioned once the biological treatment system is brought on line permanently and TSF seepage has decreased to 1.0 gpm or less. The 1300 Adit ground water discharge would be treated by a ferric sulfate coprecipitation system. No monitoring is proposed to ensure the adit discharge meets ground water standards once it leaves the chemical addition building.

Once the site has been successfully reclaimed, the SWPPP would be vacated including the associated monitoring. Thus, the only prescriptive ongoing monitoring of reclamation features would be through Operating Permit 00100.

DEQ has not developed a supplemental specific monitoring and maintenance program as part of the Existing Plan bond recalculation. Essentially, the long-term monitoring and maintenance plan in the recalculated bond is the same as the existing operational monitoring and maintenance plan.

The Applicant's Proposed Plan provides for additional monitoring in order to verify the success of the reclamation plan. Primary resources to be monitored

would be surface water and ground water, and revegetation success, including canopy cover percentage, biomass production and weed control.

Continued wildlife monitoring would not be required. Monitoring of TSF water, revegetation and noxious weeds would be required.

Ground water wells would be monitored to verify that the post mining water quality is statistically at least equal to the pre-mining/operational data set. That is, the current data do not show impacts, other than the isolated monitoring well MW-10 area (Issue 16-Ground Water). Water quality samples would continue to be collected until a statistically valid conclusion could be drawn that water quality had not degraded following reclamation.

Bear Creek would be monitored upstream and downstream of the MHM area during and following reclamation to collect an adequate database for statistical comparison to the pre-mining/operational data set. No impacts to Bear Creek quality from the TVX mining operations have been detected to date, and post-closure monitoring would continue until a statistically valid conclusion could be drawn that water quality had not degraded following reclamation.

Erosion is a function of the reclaimed landforms (slopes), soils, and revegetation cover. TSF landform slopes have already been configured at less than the permitted inclination (6:1 rather than 4:1) as verified by inspection. Salvaged soil would be applied and replacement soil depths verified by inspection. Revegetation success would be measured by monitoring plant community canopy cover and biomass production. Revegetation success would be achieved when 80 percent total canopy cover and second-year biomass production of 715 lb/acre as predicted by the EDYS model were met. When the 80 percent canopy cover goal was achieved, the storm water permit could also be retired.

Capping the TSF is expected to reduce the seepage rate to less than 1.0 gpm within 1 year. Seepage from the TSF would be treated in the RO unit until the seepage rate drops below the 1.0 gpm trigger level. At that point, the TSF seepage would be routed into the biological treatment system. Brine from the RO unit would be evaporated, and the remaining solids would be disposed of at an approved solid waste disposal facility as is done operationally.

Climatological wet cycles could result in occasional periods of seepage into the reclaimed pile in excess of 1.0 gpm. Temporary water retention in the tailings pile would provide surge storage, which would be detained via outlet control. A conservative analysis of water retention in the TSF was calculated (AKI, 2000a). An



assumption of 125 percent of average annual precipitation was assumed over a 32-year period. The 32-year rainfall record used in the EDYS modeling was employed. Gardiner precipitation records were adjusted to the Jardine location and then multiplied by 125 percent to obtain a conservative simulation.

Some water retention in the TSF would occur for six of the first nine years following reclamation. Beyond that time, only one other year is predicted to result in additional retention within the pile. Water buildup would be consistent with operational conditions. Piezometers within the TSF would be monitored to document the phreatic surface to confirm the conservative predictions are not exceeded.

Storm and snowmelt peaks would continue to be greater than 1.0 gpm for some time, but retention in the pile, as proposed, is designed to control that water over time. Bond would be set to ensure that monitoring and treatment would continue for 100 years (Issue 11).

Ongoing maintenance would be required post-closure for the Crevice Adit, 1300 Adit, and TSF water systems. The Crevice Adit would be inspected on a weekly basis for safe access to the pipeline inlets underground, and system operation. The 1300 Adit pipeline and chemical addition building would be inspected weekly and maintenance performed as needed, including restocking the treatment chemical (ferric sulfate). Over the short term, the TSF RO/evaporation treatment system would be maintained on a daily operational basis. The schedule for inspection of the biological treatment system would initially be on a daily basis, but following start-up would be reduced to a weekly basis. Repairs would be made as needed, and reagents (sugar-alcohol mixture) would be restocked on roughly a quarterly basis.

The Jardine Historic District water supply system would be converted to 100 percent gravity flow, and inspections would be reduced to weekly, with repairs made as needed.

TVX would be responsible for all monitoring and maintenance under Operating Permit 00100 and the MPDES. TVX would be required to continue the monitoring and maintenance until bond is released under the operating permit. TVX would be liable for monitoring and maintenance under the MPDES for as long as the permit is required. Once the USFS takes over the property, they would inherit the MPDES monitoring and maintenance responsibility.

No monitoring or maintenance of installed bat grates is proposed.

#### Agency Modified Plan

Based on joint DEQ/applicant review of the revegetation data, including cumulative data obtained to date, the only changes proposed by DEQ to improve the CCP revegetation plan include modifications of the seeding mixture and rates, planting trees on slopes of the TSF and other recommendations from a review of the site in 2000 by an expert on hard rock revegetation practices (Producers, 2000b, see *Appendix B*). For more detail see Issue 9, Revegetation. Should the data indicate the vegetation canopy cover and species composition are less than the EDYS model second-year predictions, DEQ would require additional remedial vegetation enhancement. Based on results obtained from first-year revegetation test plots on the OTS and 10-year old revegetation on the south slope of the TSF, DEQ considers these objectives conservative (Shepherd Miller, Inc., 2001).

DEQ would require that a detailed revegetation monitoring plan be developed. This plan would specify the methodologies for annual measurements to be employed in the monitoring.

DEQ has bonded to implement a modified, as needed, version of the long-term hydrologic monitoring program presented in the applicant's proposal as Appendix 10 (AKI, 2000a). Monitoring would be conducted to verify that the goals of the reclamation plan would be achieved. Because there are multiple goals, such as 1) protection of water quality, 2) establishment of wildlife habitat, and 3) creation of erosionally stable landforms, monitoring methods and terms would vary. Monitoring would continue until each individual goal was successfully achieved as verified by monitoring information.

An additional water monitoring site would be added to the hydrologic monitoring network located downgradient of the mix box with Crevice Adit water at the upland HDS to assure the TSF seepage, as applied, meets ground water quality standards (Figure 1, Option A, *Appendix D*). Another new site would be monitored after the ferric sulfate was added to ensure the 1300 Adit discharge meets ground water standards for arsenic in the dosing tank before it enters the septic tank drainfield (Figure 1, Option C, *Appendix D*). This monitoring site would be in the dosing tank. Finally, DEQ would require a monitoring point below the TSF if a contingency water management plan is needed while the TSF systems are down for repairs or maintenance (Figure 1, Option B, *Appendix D*).

DEQ would require the applicant to utilize Crevice Adit water as necessary in the hydrologic contingency measures required for treatment of discharge from the 1300 Adit and the TSF (*Appendix C* and *Appendix D*).

Adequate bond would be retained by DEQ to perform the long-term monitoring and maintenance, in the event of default or failure to perform by the applicant for 100 years. For additional information, please refer to the discussion on Issue 11-Bond.

#### Cumulative Effects

No other major projects currently exist in the Bear Creek valley. Firewood cutting on National Forest lands would continue for personal use, and occasional small sales of house logs, post/poles and other miscellaneous forest products may occur. Pre-commercial thinning would occur as needed. The Darroch-Eagle Creek timber sale could potentially impact Bear Creek water quality, but these effects would be identified by the upstream MHM monitoring site. Upstream-downstream differences between the MHM Bear Creek sites would be independent of upstream impacts. Prudent permitting of the Darroch-Eagle Creek timber sale and other USFS activities would ensure protection of Bear Creek water quality, and any short-term impacts from timber sale activities would not be cumulative.

Noxious weed control in compliance with Park County requirements would continue. Dispersed recreation in the Bear Creek valley would continue. With mine closure, more lands would be available for recreational and wildlife use. No impacts to the MHM area ground water and surface water have been identified by the 12 years of pre-mining and operational monitoring. By reclaiming the site, post-closure impacts should be negligible, and no cumulative impacts are expected.

The bat grate on the Crevice Adit and the First Chance Portal would be inspected annually for competence and effectiveness in preventing unauthorized entry. The other bat grates were voluntarily installed by TVX

#### **Issue 7. Future Land Use**

##### Affected Environment

The MHM claim block, consisting of 556 acres, is currently used for wildlife habitat, mine staff housing, recreation, and mining (Figure 3-1).

The property is not open and accessible to the general public. Fencing and signing warn the public of the presence of private mine property. The public does use the Bear Creek Road to get through the property to USFS lands above the mine site (Figure 1-2). In order to address potential health and safety issues, six potentially hazardous openings have been closed to date, and the historic arsenic mill and cyanide leach plant have been reclaimed. Modern mining impacted the historic 1300 Adit flow. The water does not meet

water quality standards and is being treated under the MPDES permit.

As reclamation proceeds and facilities are removed on the site, taxes have been reduced. In 2000, TVX paid \$90,000 in property taxes. The current county assessed value of the property is \$8,259,091. The company employs a 10-member staff on a full time basis and also regularly uses contractors, all of which is a benefit to the local economy and tax base.

TVX is liable and responsible for current operations and closure efforts. The company is also responsible for long-term future maintenance of the water treatment facilities, including those associated with the MPDES permit. To assure the State that the reclamation would proceed as approved in the Existing Plan, a \$7,607,202 bond has been posted for the operating permit. Another \$100,000 has been posted for exploration activities under the exploration license. If significant reclamation progress is not made by July 1, 2001, another increment of \$1,124,400 would be due.

The MHM property encompasses the Jardine Historical District. There is currently a mitigation plan that is a part of the existing operating permit. This mitigation plan requires that TVX will not disturb any of the historic structures. New structures related to the current mill and mine detract from the historic district. The expansion of the mine and mill parking lot and snow loads have impacted the historic Red Mill.

As discussed under Issue 3, one of the Crevice Adit drill holes was completed and permitted as a water supply well for the Jardine Historic District. This well feeds a 50,000-gallon surface storage tank, which supplies both potable and fire suppression water.

The MHM site is wholly within the Greater Yellowstone Ecosystem. Most areas surrounding the mine site are predominantly maintained to improve wildlife habitat. This site has only had limited use by wildlife since 1986 because of the industrial activities on the site,

##### Existing Plan

Post-mining land use in the Existing Plan is wildlife habitat and livestock grazing which are consistent with current land uses (DSL and USFS, 1986, p. III-65). The agencies evaluated the approved reclamation plan in the 1986 EIS and concluded that the reclamation plan would produce comparable stability and utility for the proposed post mine land use. There is no public access to the property provided in the existing plan of operations. The public has access through the property on the Bear Creek Road.

No historic openings would be reclaimed as part of the existing reclamation plan. The process ponds that contained metal-laden sludge have been removed, as have the OTN and the OTS. These metal-contaminated materials have been moved to the TSF. A total of 69 acres was disturbed under approved Operating Permit 00100. All acres are to be regraded, spread with soil material and revegetated unless the disturbances are being left as part of a post-mine road system. There is no treatment plan for TSF seepage in the Existing Plan, but it is being treated as part of the MPDES permit. No plan exists for reclamation of the SCP. The SCP would be left as a small lake.

Ten TVX employees plus contractors would be used to complete the reclamation. When reclamation is complete, one part-time employee would maintain the facilities on the site, including the water treatment plant. As reclamation has proceeded on the property, the removal of real property has resulted in a reduction in the assessed value for tax purposes. Once the mine site is fully reclaimed, it is estimated that the property would be worth several million dollars. (Dave Viers, 2000. Personal communication to Frank Bergstrom, July.)

As holder of Operating Permit 00100, TVX is liable for the operations and closure efforts as stated above, including the responsibility for long-term future maintenance of the water treatment facilities and maintaining compliance with the MPDES permit. The reclamation bond has been recalculated at \$4,206,040. This is to ensure that the reclamation would be completed. The water treatment portion of the bond is \$4,478,000.

The existing operating plan does not specify what the future land use potential would be after bond release. The MHM area has gone from periods of activity to periods of inactivity for the past 120 years. It is feasible that a future land use for the site could be reactivation of mining. Many private lands in the Gardiner area have been subdivided for homes or recreational properties. This is a possible future use for the private land owned by TVX once reclamation is complete and the bond is released. In these cases, the new owner would assume the long-term monitoring and maintenance of facilities under the MPDES permit.

The Jardine Historical District would continue under the operating permit mitigation plan until the reclamation bond is released. The historical integrity of the site would be improved with the removal of the newer structures that detract from the historic district. The existing Jardine water system, including the 50,000-gallon surface storage tanks that supplies both potable and fire suppression water, would be removed. The use of high quality water from the Crevice Adit well would be eliminated when the adit is plugged.

The reclamation of the site would result in improved wildlife habitat. Migration potential for large mammals would be enhanced with the cessation of the mining and mining related activities.

#### Applicant's Proposed Plan

The future land uses for the reclaimed mine would essentially be the same as the Existing Plan. The applicant has indicated that the surface and mineral estate of the property would be donated to the USFS. If the USFS eventually takes over the property, the bond would be released to TVX and the responsibility and liability of the site would be assumed by the USFS. Under USFS management, the land would not be open for location and entry under the mining laws. The land would be removed from the tax base of Park County, and would be unavailable for subdivision activity.

Public access would be controlled to reflect the management direction of the USFS for the site. Maintenance of wildlife habitat, including elk migration from and to Yellowstone National Park, is one of the goals of the Gallatin National Forest Land Management Plan. As such, the USFS has indicated the MHM area would be managed for wildlife habitat and water quality protection. In addition, the USFS would manage the site for its recreational, historical and educational values.

In order to create a safe site, 12 potentially hazardous openings would be closed (AKI, 2000a, Table 7). The TSF seepage would be treated with a biological treatment system. The TSP growth media cap would be increased from 15 inches to a total of 48 inches. The SCP would be reclaimed to the wet meadow HDS.

Employment levels during reclamation and in the long term would be the same as the Existing Plan. The part-time person employed for monitoring and maintenance of the water treatment facility could be employed or contracted by the USFS. When reclamation is complete, the value of the property would still be estimated at several million dollars as in the Existing Plan.

As in the Existing Plan, TVX is liable and responsible for current operations and closure efforts until bond release. If the USFS becomes the owner of the property, the Federal Government would assume responsibility for long-term future maintenance of the water treatment facilities, including the MPDES permit. The MPDES permit for the 1300 Adit discharge, the Crevice Adit discharge and TSF seepage would be revised (*Appendix C*).

The mitigation applied to the Jardine Historical District would remain the same as discussed under the Affected

Environment and the Existing Plan until the bond is released. If the USFS assumes ownership of the property, the management of the Jardine Historical District would be assumed by the USFS. A restoration plan would be developed for the site. The site would be used for interpretive purposes.

The Crevice Adit well source for potable and fire suppression water would continue to be utilized. The operational system would be upgraded to a gravity flow system. In addition, the pipelines supplying the water would be buried and the storage tank would be modified so that in the winter up to 40 gpm would overflow the tank via the outlet pipe in order to prevent freezing (Figure 2-6).

The impacts on the Greater Yellowstone Ecosystem would be the same as the Existing Plan. If the land were donated to the USFS, the potential for negative impacts to wildlife habitat from future mining or subdivision activity would be eliminated.

#### Agency Modified Plan

The Agency's Modified Plan is the same as the Applicant's Proposed Plan. DEQ and the USFS would consult the State Historic Preservation Office on the closure of the historic openings

#### Cumulative Impacts

No other land use change proposals in the area would cumulatively affect land use on the site.

#### **Issue 9. Revegetation**

##### Affected Environment

The features that must be reclaimed are the regraded unvegetated tailings pile, development rock piles and other miscellaneous disturbances such as the process plant site, roads, and soil and borrow areas. Overall, the 1986 EIS contemplated reclamation of 67 acres of newly disturbed native vegetation and 26 acres of previously disturbed land (p. III-25). Other amendments and revisions to the operating permit since 1986 have increased the permitted disturbance total to 106 acres.

No areas permitted under Operating Permit 00100 have been permanently reclaimed (i.e., had bond released as of the end of 2000). Roughly 11 acres of pre-law areas (areas disturbed before passage of the Metal Mine Reclamation Act in 1971) have been reclaimed as of the end of 1999. These pre-law areas include the OTN, the historic arsenic mill mine wastes, and the old cyanide leach plant disturbances. A total of 16.7 acres of area disturbed under Operating Permit 00100 were reclaimed in 2000.

The OTN and OTS areas are historic tailings deposits from operations prior to 1948 (Figure 1-2). These sites were to be reclaimed as part of the overall area reclamation plan, as discussed in the 1986 EIS. The OTN tailings were removed to the TSF in 1995, and clean backfill was imported to reestablish the grade. Revegetation efforts were completed in 1999, achieving 80 percent canopy cover, and the storm water permit was vacated.

The OTS was another larger tailings deposit located just north of the TSF. These tailings were removed to the TSF in 2000 under the Existing Plan. Underlying soils with total arsenic concentrations above 100 ppm were also excavated and hauled to the TSF. Clean backfill was imported to bring the OTS area back to grade, and 12 inches of soil was imported from an on-site storage pile. The area has been seeded with the grassland seed mix and planted with sagebrush and rabbitbrush tubelings.

Some of the development rock piles were regraded to reestablish the approximate original slope profile in 2000. The First Chance Portal (Crevice Mountain), Top-of-hill, 450 Level, and 750 Level have been regraded. Portals were first plugged with backfill and a concrete bulkhead. Soil stored at these sites in stockpiles or in the fill slopes was replaced to at least 8 inches in thickness, the areas were mulched with composted wood waste (excluding 750 Level, which could not be completed prior to winter, and First Chance Portal). Exclusive of the First Chance Portal and 750 Level, these areas were seeded with the Douglas fir seed mix, and planted with Douglas fir, woods rose, gooseberry, and snowberry tubelings.

Roads were reclaimed by casting fill material against the road cut slope to reestablish the preconstruction contours. The fill material included the preexisting soil, so no additional soil was applied. The areas were seeded with the Douglas fir seed mix and planted with Douglas fir tubelings.

No bond has been released to date for reclamation on the MHM site. This EIS considers reclamation of the 25 acres of remaining disturbed area associated with the TSF, and the water management systems for MHM drainages (Figure 2-6 and 2-9).

Operationally on the TSF, storm water from the unreclaimed surface reported to the SCP and had to be treated with the seepage from the TSF underdrain. The total flow that was treated ranged from 2-60 gpm and averaged 3.0 gpm in 2000 (Figure 3-2). The OTS and the contaminated soil under the TSF was removed to the TSF in 2000. In addition, 18 inches of clean alluvial borrow materials were placed on the TSF in 2000. The storm water was diverted off the TSF after

the soil was placed, reducing the volume of water needing treatment in the RO/evaporation treatment plant.

The 1986 EIS discussed the metal content in vegetation on the site because of the presence of historic mine wastes on the site (p. III-20-22). Exposure of plants and animals to metal-laden tailings has been historically high. The OTN tailings were reclaimed in 1995. The OTS tailings were reclaimed in 2000. Reclamation of these historic disturbances during operations has reduced the presence of metals in surface areas, which would be available for erosion to surface waters, ingestion by animals, and uptake by plants. Very little vegetation volunteered on the old tailings deposits in the area over the years.

The fence surrounding the TSF was removed in 2000 during the regrading activities on the TSF.

The existing bond includes costs for revegetation, erosion control and repair, and noxious weed control for 5 years.

#### Existing Plan

The Existing Plan for revegetation calls for the establishment of grassland and Douglas fir open forest. Two seed mixes were proposed, one for grassland and one for Douglas fir areas. The original seed mixes contained 14-15 species, of which three were introduced species. The mixes would be seeded at a rate of 29-33 lb/acre. These mixes have produced acceptable results for revegetation on the small number of acres reclaimed during mine life. For a detailed description of the original seeding mixtures, refer to the 1986 EIS (p. III-27).

The applicant-proposed seed mixes were similar to the original seed mixes but were modified in 2000 after comments were received by Yellowstone National Park botanists, who wanted to reduce the use of introduced species. TVX voluntarily revised the seed mixes and used the new mixes to seed the areas reclaimed in 2000.

The Existing Plan would replace 8 inches of soil or 4 inches of borrow material and 4 inches of soil on all disturbed acres except the TSF. The soil salvaged and stockpiled on site and borrow materials to be used are from on-site approved sources. On some disturbances the soil and subsoil are to be found in the fill slopes adjacent to the disturbances. These areas may not need any additional soil. No other soil amendments were proposed. A surface mulch like straw, woodfiber or cellulose was proposed to protect the site from erosion and to protect seedlings during the establishment phase.

The TSF would receive 15 inches of growth medium including 3 inches of gravel and 12 inches of stockpiled

soil over the compacted clay-amended tailings (Figure 3-3). The upper 9 inches of tailings would be amended with bentonitic clay and compacted to limit infiltration of water into the tailings.

Roots were not intended to grow into the compacted layer. Root penetration would be inhibited by tailings texture, compaction and quality but not eliminated (Shepherd Miller, Inc., 2000b and 2001). Shallow rooting into tailings was observed in the OTS test plots under 1 foot of soil cover during the first growth season, and on the 10-year old reclaimed south slope of the TSF. Roots were also observed to grow only in the upper two inches of tailings in 1986 (DEQ and USFS, 1986).

On-site research has shown that roots will penetrate into the tailings without resulting in phytotoxicity due to metals (Shepherd Miller, Inc., 2001). Reclamation of the TSF would reduce the potential exposure of metals to plants and animals. Plant roots would likely accumulate at the interface between the tailings and growth medium.

No trees and shrubs were proposed to be planted on most of the reclaimed acres in the Existing Plan. DEQ modified this requirement in 2000 and allowed TVX to plant trees on some of the development rock piles. Woody plants would not be planted on the shallow 15-inch cover system on the TSF because deep roots would produce drainage conduits into and possibly through the clay barrier layer, and tree windfall could increase the exposure of the tailings to seepage.

Invasion of vegetation from surrounding areas would inevitably result in the establishment of Douglas fir and other deep rooting species like noxious weeds which could compromise the low-permeability compacted bentonite-amended tailings. Trees that would naturally invade the reclaimed TSF would be removed as part of long-term maintenance to prevent damage to the clay layer of the cap. The Existing Plan bond does not include this long-term maintenance need for the TSF.

Noxious weeds would have to be controlled until the operating permit bond is released. After bond release, the landowner would still have to control noxious weeds under the Montana County Noxious Weed Control Act.

The 1986 EIS concluded that the existing reclamation plan would produce acceptable revegetation results on all reclaimed acres. Vegetation establishment on the Existing Plan approved TSF reclamation cap design was modeled using the EDYS computer model (Shepherd Miller, Inc., 2001). The model run predicted vegetation would produce 715 lb/acre (80 grams/square meter) by the end of 2 years (AKI, 2000a). Vegetation establishment on the other disturbed areas would be



expected to be less than the TSF because of the thinner 8-inch soil replacement depth.

This amount of vegetation cover would meet comparable stability and utility for the proposed post mine land use but the results would be limited because of the limited soil depth (Coppinger, et al, 1993). Impacts from the lack of soil on vegetation cover and biomass would be most critical on the TSF where healthy plant communities are needed to enhance evapotranspiration that would reduce long-term TSF seepage. Fifteen inches of plant growth medium would limit total evapotranspiration potential. The EDYS model predicted seepage from the revegetated TSF would range from 0.005-0.85 gpm with an average seepage rate of 0.22 gpm (Table 3-5). All storm water flow would not report to the SCP as it did in operational conditions.

The 1986 EIS observed that metals content in vegetation grown on thin soils overlying OTN tailings, was similar to the modern and OTS tailings, and was within normal ranges (DSL and USFS, 1986, p. III-22).

Reclamation of the existing disturbances on the site would reduce the potential accumulation of metals in plant tissue, exposure of metals to ingestion by animals and erosion of metal laden sediment to surface water over operational conditions. The shallow soil replacement depths would still put metal-containing mine wastes in contact with some of the plant roots.

The recalculated bond for the Existing Plan would include costs for revegetation, erosion control and repair, tree removal, and noxious weed control for 5 years. The Existing Plan does not replace the fence on the TSF to prevent grazing impacts.

#### Applicant's Proposed Plan

The Applicant's Proposed Plan for revegetation calls for the establishment of the same grassland and Douglas fir open forest communities, except 14 more acres would be converted from grassland to Douglas fir forest. Two seed mixes were proposed one for grassland and one for the Douglas fir areas.

These seed mixes were revised as previously described in the Existing Plan section based on comments received from Yellowstone National Park personnel during the scoping process. (Copies of the seed mixes can be found in the CCP (AKI, 2000a)). The revised seed mixes contain 15-16 species of which only one or two are introduced species. The mixes would be seeded at a rate of 65 lb/acre. The seeding rate was increased to improve initial vegetation establishment, control erosion and limit noxious weed establishment. Trees would be planted at a rate of 400 seedlings/acre on top

of the TSF and no seedlings would be planted on the slopes.

The Applicant's Proposed Plan would replace the same amount of soil as the Existing Plan (8 inches of soil or 4 inches of borrow material and 4 inches of soil) on all disturbed acres except the TSF. TVX has proposed an alternate cap design for the TSF consisting of 12 inches of soil and 36 inches of subsoil. This 48-inch cap would be placed over unamended compacted tailings. This water balance cap design is intended to produce a woody plant community with a greater rooting depth (Figure 3-3) and more evapotranspiration (Table 3-2).

The EDYS model was run to compare the Existing Plan cap design with the Applicant's Proposed Plan cap design for the TSF. The TSF would receive 12 inches of soil under both reclamation alternatives. In the proposed closure plan, an additional 36 inches of subsoil would be placed on the TSF and trees and other woody plants would be planted immediately.

Revegetation success under a range of climatic and land use situations was modeled for both alternatives. Invasion by woody species was considered by limiting the presence of seedlings to 5 percent for the first 10 years. For the longer term (200 years), invasion by woody species was modeled using more trees (AKI, 2000a, Appendix 6 Sub-Appendix C, Attachment III, p. 7). Douglas fir seedlings would be planted along with the Douglas fir open forest seed mix, and woody species would become established immediately.

Woody plants would not be discouraged as in the Existing Plan from growing in the deeper 48-inch cover system on the TSF. With that soil thickness, roots would be less likely to produce drainage conduits and the drainage past the rooting zone at the 48-inch depth would be significantly reduced.

The clay barrier layer is not a part of the Applicant's Proposed Plan, so roots would not compromise the integrity of the cap function. Trees that would naturally invade the reclaimed TSF would not have to be removed as part of long-term maintenance to prevent damage to the cap function.

Invasion of vegetation from surrounding areas resulting in the establishment of Douglas fir and other deep rooting species like shrubs would not compromise the cap function but would enhance evapotranspiration.

EDYS simulations constricting root penetration to 48 inches were made, resulting in drainage rates very similar to an unrestricted rooting depth simulation. In all cases, drainage below the rooting depth is less under the Applicant's Proposed Plan than for the Existing Plan

Root penetration would still be inhibited at 48 inches at the tailings interface by tailings texture, compaction and quality, but not eliminated. DEQ estimates that 80-90 percent of the root biomass for the Douglas fir community planned on the TSF would be located in the upper 48 inches of the rooting zone. The tailings would not be used as extensively by the plants for a rooting medium as in the Existing Plan. Plant roots would still accumulate but to a lesser degree at the interface between the tailings and growth medium.

Tree windfall would be more likely to increase the exposure of the tailings to increased seepage than the 15-inch growth medium in the Existing Plan. Both plans would not eliminate seepage completely and would require backup systems for water treatment. However, DEQ believes the long-term benefit of increased evapotranspiration from a plant community dominated by woody plants on the TSF exceeds the potential detrimental effects from tree windfall in the future. In addition, based on Producers' review of revegetation practices at the MHM in 2000, the heavy seeding rate would eliminate the potential survival of trees on the TSF without some changes to the plan.

As in the Existing Plan, noxious weeds would have to be controlled until the operating permit bond is released. After bond release, the landowner would still have to control noxious weeds under the Montana County Noxious Weed Control Act. If the USFS takes over management of the site, the Federal Government would be responsible for long-term weed control.

The EDYS model predicts successful vegetation establishment in a short time frame as measured by above and below ground biomass (Shepherd Miller, Inc., 2001). The EDYS model results predict a relatively productive vegetation cover (715 lb/acre) (70-80 g/m<sup>2</sup> above ground biomass) by the end of the second growing season (AKI, 2000a). Vegetation test plots were installed on the OTS during the 2000-growing season. Three depths of soil were applied: 1) 12 inches of natural soil; 2) 12 inches of constructed soil (45 percent sand and gravel, 45 percent silt, 6 percent manure, 4 percent wood chips), and no soil (bare tailings). Three fertilizer plots were tested: manure, no manure and inorganic fertilizer. Above ground biomass was sampled in August 2000 (Shepherd Miller, Inc., 2000b). Total above ground biomass for the soil treatments ranged from 500-1410 lb/acre (56-141 g/m<sup>2</sup>).

A comparison of the sampled values from OTS test plots and the values that were predicted by the EDYS simulations indicate that the first-year plant community was more productive than predicted by EDYS. EDYS predicted root biomass values were similar to the sampled values. EDYS simulated values also compared favorably with site-specific data collected from a 9-

year-old revegetated slope on the south face of the TSF (Shepherd Miller, Inc., 2001).

These results confirm the predictive ability of the EDYS model, in that second growing season biomass had been achieved during the first growing season. This is consistent with production results on the OTN area, which was reclaimed in 1995 and the south face of the TSF, which was reclaimed 9 years ago.

The reclaimed grassland community on the south face of the TSF had a total above ground biomass of 992 lb/acre, with 900 pounds of grasses, 45 pounds of shrubs, and 47 pounds of forbs. The EDYS simulation for harvestable above ground biomass (total above ground minus basal crown material) in the 9th-year was 1107 lb/acre, with 1050 pounds of grasses, 17 pounds of shrubs, and 40 pounds of forbs (Shepherd Miller, Inc., 2000a). The EDYS simulations were 90 percent accurate for predicting total above ground biomass and 94 percent accurate for predicting grass biomass. EDYS under estimated shrub biomass.

The EDYS drainage predictions are slightly conservative because there was more shrub biomass on the slope than EDYS predicted. More shrubs would result in higher water use, and therefore less seepage (Table 3-2) (Shepherd Miller, Inc., 2001).

TVX has been importing soil, horse manure, grass clippings, wood waste and other organic amendments to the mine site to enhance revegetation success and stimulate nutrient cycling in the reclaimed soil profile. The soil organic amendments would be incorporated up to 6 inches deep into the soil. Research by Producers and others has shown that organic matter amendments to reclaimed soils can increase the soil microbe communities and therefore enhance soil health and revegetation success (Producers, 2000a and *Appendix B*). The downside of importing soil and organic amendments is that these amendments can contain noxious weed seeds.

DEQ has approved the use of the Brogan Pit near Corwin Springs, MT as a soil source (Issue 10- Noxious Weeds). TVX has established some test plots and has been evaluating different amendments for revegetation potential and noxious weed presence. No noxious weeds have been documented to date. Horse manure has been composted on the site for two years. Composting would reduce noxious weed potential problems.

Producers' research has shown that certain amendments favor bacteria-based soil microbe communities over fungi-based soil microbe communities (Producers, 2000a). TVX has proposed adding rather large amounts of horse manure to reclaimed soils. This would favor bacteria-based soil microbe communities



and would favor grasses over trees. This would be detrimental to the TSF, which relies on Douglas fir and other woody plant establishment to reduce TSF seepage in the long run.

The organic amendments added to the 8 inches of soil replaced on other disturbances than the TSF would enhance revegetation success over the Existing Plan.

The EDYS model predicted that the 48-inch water balance cap on the TSF would reduce seepage to 0-0.78 gpm or an average of 0.14 gpm. All storm water flow would not report to the SCP as it has in operational conditions. This predicted seepage rate is 36 percent less than the Existing Plan.

A criterion for bond release would be the establishment of sufficient vegetation production and canopy cover. The company has proposed 715 lb/acre above ground biomass and 80 percent canopy cover. Plant succession would be expected and desirable. The Applicant's Proposed Plan would double the seeding rate, to 65 pounds per acre, to help promote a dense stand of desirable plants and choke out pioneering noxious weeds. The heavier seeding rate, preferential use of drill seeding, expanded use of tree seedlings, addition of shrub seedlings, and deepening of the TSF cap soil depth used in the model run predicted the Applicant's Proposed Plan would result in faster establishment of a more desirable plant community than the Existing Plan.

Other facilities have been evaluated using the EDYS model. McLendon, et al, 1997 discusses other facilities that were predicted and evaluated. Shepherd Miller, Inc., 2001 provided TVX with verification of revegetation results for reclaimed areas that were 1 or 9 years old.

Performance of the Applicant's Proposed Plan is predicated on successfully establishing a tree dominated vegetation cover. In order to enhance the survivability of tree and shrub seedlings, it may be advantageous to limit grass competition in the immediate area surrounding each seeding. Several methods have been proposed by the applicant to achieve this end:

- o Ripping soil and planting seedlings on tops of furrows and allow grass seed to accumulate at bottom of furrows;
- o Scalping grasses by hand;
- o Placing geotextile around seedlings;
- o Applying chemical spray; and
- o Reducing the grass seed application rate to roughly 30 pounds per acre and eliminating introduced species from the mix.

DEQ does not believe these measures would adequately guarantee the survival of trees and other woody plants on the reclaimed areas, based on Producers' review of

revegetation at the MHM (Appendix B). Species diversity and plant succession would be severely limited by the heavy seeding rate and competitive nature of the species that initially established (Egler, 1954).

The bond for the Consolidated Closure Plan would include money for revegetation, tree planting, erosion control and repair and noxious weed control for 5 years. No fence is proposed to be constructed to protect young shrubs and trees from browsing animals.

#### *Metals Content and Vegetation*

Phytotoxicity from aluminum, arsenic, copper, iron, lead, selenium, or zinc is not likely for plants growing on 12 inches of soil over the tailings. Based on literature toxicity values, there could be some phytotoxic effects from manganese to some forb species (EDE, 2000). However, site-specific observations and production data do not support the hypothesis of phytotoxicity from this element.

Dietary toxicity to animals from the consumption of plants growing on 12 inches of soil placed over the tailings is not likely for arsenic, copper, lead, selenium, or zinc (EDE, 2000). Based on literature data, there is the possibility of limited toxicity to some animals from aluminum, iron, and manganese concentrations in the plant tissues. However, any such potential toxicity would probably be limited to reduced growth rates, and then only to animals that fed exclusively on lambsquarters (*Chenopodium album*) (Note: Plant scientific names are based on Hitchcock and Cronquist, 1973). Lambsquarters is the only species on site that was found in the review that would accumulate any of these elements. The amount of forage produced by lambsquarters, and the fact that this species is a pioneering species and only productive for 1-2 years, would significantly reduce the potential hazard through the dietary pathway.

These tissue concentration data were derived from two test plots which had 12 inches of soil placed directly over tailings (EDE, 2000). This is not the design for the TSF cover. The TSF cover design is 36 inches of alluvial borrow material placed over the tailings, with 12 inches of soil placed on top of the alluvium. This produces a cover four times as thick as the test plot treatments. The maximum first-year rooting depth on two other test plots was 15 inches on a soil treatment plot and 22 inches on an alluvium treatment plot. In both cases, significant amounts of roots were in the top 2 inches of underlying tailings. Therefore, bioconcentration of the metals would be higher than if the roots had been confined to clean cover materials only.

Based on the data (Shepherd Miller, Inc., 2001), roots would not be expected to reach the tailings on the 48-inch TSF cover design in one year. Lambsquarters is an annual species. It is doubtful that any significant amount of lambsquarters roots would reach the TSF tailings in a 48-inch cover system, assuming that the root data collected on the test plots in 2000 is a reasonable measure of the root dynamics for these plants in most years. This conclusion is supported by the only report of maximum rooting depth for the genus *Chenopodium* known from the literature. Tierney and Fox (1987) reported a maximum rooting depth of 12 inches (30 cm) for *Chenopodium fremontii* at Los Alamos, New Mexico. Therefore, the high tissue concentrations resulting from the test plots would not be repeated on the TSF cover. If this is correct, toxicity to either plants or animals is not likely to occur on the proposed TSF cover.

Background soil and plant tissue metals content were measured at four sites. Aluminum concentrations were highest in western wheatgrass and lowest in kochia. Aluminum concentrations in western wheatgrass were higher in the background samples than in samples from the test plots. Although the aluminum concentrations in background soils were also higher than in the test plot soils, they were not high enough to explain the higher tissue concentrations. Aluminum tissue concentrations in mountain brome were about equal between background and test plots, and concentrations were lower in kochia from background plots than on test plots. Aluminum concentrations in lambsquarters were much lower from background samples than from test plots samples.

Arsenic concentrations were highest in the grasses and lowest in the forbs from background soil plots. Concentrations were higher in test plot samples than in background samples for all four species.

Copper concentrations were approximately equal among the four species tested in background samples, with concentrations in the forbs only slightly higher than in the grasses. Concentrations were higher in test plot samples than in background samples for all four species.

Iron concentrations in background samples were highest in western wheatgrass and lowest in kochia, with intermediate concentrations in mountain brome and lambsquarters. Background concentrations were higher in western wheatgrass and mountain brome than test plot concentrations, but background concentrations were lower than test plot concentrations for kochia and lambsquarters.

Manganese concentrations in background samples were highest for western wheatgrass and lowest for lambsquarters, with concentrations in mountain brome

and kochia about equal. Manganese concentrations in test plot samples were higher than background tissue concentrations in all four species.

DEQ believes that the 48-inch cover on the TSF would produce fewer overall concerns about metal concentrations in the future than the Existing Plan 15-inch soil cover.

#### Agency Modified Plan

Changes proposed by DEQ to improve the CCP revegetation plan include modifications of the seeding mixture and rates, planting trees on slopes of the TSF, fertilizer rates, and soil organic amendment practices as recommended by Producers' review of revegetation on the site in 2000 (*Appendix B*).

Reclamation in Montana at other hard rock mines has shown that heavy seeding rates can produce a quick cover that effectively controls erosion. Research has shown that heavy seeding rates can limit success to one or two species that establish rapidly (*Appendix B*). The agency has proposed altering the seed mix and other revegetation procedures to enhance the potential for the establishment and survival of trees on the TSF based on the recommendations by Producers. A plant community dominated by woody plants would be needed to reduce the long-term seepage rate to less than 1.0 gpm.

TVX claims that the natural succession predicted by EDYS is substantiated by the ninth growing season production on the south TSF slope, in terms of percentage of grass, shrub, and forb cover. Woody plant dominance is critical to reduce seepage from the TSF (Shepherd Miller, Inc., 2001), but on other reclaimed mine sites in Montana, tree and shrub survival has been marginal.

The applicant may request a reduction in the seed rate on the TSF through elimination of introduced species contained in the seed mix, based on results obtained for 2000 season reclamation of development rock piles. Introduced species comprise about 20 percent of the seed mixes. DEQ does not believe that the elimination of just the introduced species would be enough based on Producers' review (*Appendix B*).

DEQ would require TVX to hire a mined land revegetation specialist to prepare a revised soil amendment and revegetation plan based on Producers, 2000 recommendations (*Appendix B*). This would include a revised seed mix for the site (about 10 lb/acre) that would ensure survival of tree and shrub species and allow natural invasion of other native species. The plan may also call for more tree and shrub planting. DEQ is less concerned with initial erosion rates and the potential for some noxious weeds to become established initially, than the lack of tree and shrub

dominance in the long run. Slopes on the TSF are shallow (<4:1) limiting erosion potential and noxious weeds have been adequately controlled in the past.

DEQ would require the revegetation specialist to provide recommendations for organic matter amendments and rates. Wood-based organic amendments would favor dominance by fungi-based soil microbes and, therefore, trees. Manure would favor bacteria-dominated soil food webs preferred by grasses (*Appendix B*). Fertilizer recommendations would also be addressed in the plan based on Producers, 2000 recommendations.

The specialist would also be charged with preparing a revegetation monitoring program to ensure adequate measures are taken to guarantee dominance by trees and shrubs, especially on the TSF. The plan would monitor noxious weed invasion and control. The revised revegetation and monitoring plans would be due before revegetation commences in 2001.

The potential for future fires through the area as well as periodic blowdown of trees would increase erosion and seepage rates for a time until the site vegetation redevelops. The increased initial diversity of plants and palatability of vegetative species after a fire could result in increased utilization by elk and other ungulates until such time as the plant community reestablishes.

Blowdown by trees on the TSF has been raised as a long-term maintenance issue. DEQ is not concerned with windfall on the TSF because of the thicker 48-inch soil cap. In addition, the potential rooting zone on the impoundment has been increased in 2000 with the placement of the OTS on the TSF. TVX also removed the contaminated soils below the TSF and placed them on top of the OTS tailings. A total of 110,000 cy of tailings and contaminated soil was placed on top of the TSF. Approximately 13,000 cy of this was the contaminated soil. This represents a layer of additional soil 7 inches thick.

The modern TVX tailings contain 13,300 ppm arsenic and provide no growth media potential. Toxicity Characteristic Leaching Protocol (TCLP) analyses on modern tailings showed an arsenic level of 8.5 ppm.

The historic tailings on the mine site contain up to 13,500 ppm or 1.3 percent total arsenic. Most of the total arsenic is in the form of arsenopyrite which is not easily weathered. Arsenopyrite has a low solubility in water; therefore very little is available to plants. The average water soluble concentration of arsenic in the historic tailings are 13 ppm (DSL and USFS, 1986, p. III-21). The OTS have been exposed in the environment for many years and have reduced levels of arsenic but still do not provide a growth medium as evidenced by the limited plant growth on the OTS after several

decades. The contaminated soil placed on the TSF contains levels of arsenic that mostly range from 100-330 ppm. This amount of arsenic would not prevent the growth of plant roots. This would increase the rooting depth available for woody plants and reduce potential exposure of tailings in tree blowdown areas. DEQ believes that even in root wad divots, the amount of plant growth medium left after a blowdown would still equal or exceed the 15-inch cap thickness in the Existing Plan.

The effects of metal content in vegetation would be the same in the Agency Modified Plan as in the Applicant's Proposed Plan.

Two contingency plans for treatment of TSF seepage using Crevice Adit water would be bonded to ensure these systems are in place in case of a future fire and increased seepage until the vegetation reestablishes (Figure 1, Options A and B, *Appendix D*).

DEQ would require a fence around the TSF to protect the shrubs and trees from browsing animals until they are successfully established.

#### Cumulative Effects

There are no other proposed activities in the area that would affect revegetation potential of the disturbed areas to be reclaimed by TVX in 2001 or 2002. The Darroch-Eagle timber sale may increase the potential for noxious weed invasion if noxious weed control BMPs are not observed.

#### **Issue 10. Noxious Weeds**

##### Affected Environment

Noxious weeds are present and increasing on the surrounding private and USFS lands in the area. This is true in most areas of southwestern Montana. Seed is transported to the area on vehicles and other vectors. The presence of over 69 acres of historic and current MHM mine-related disturbances has increased the potential for weed problems on the mine site during operations. Open disturbed areas consist primarily of roads, rock piles, and tailings.

The Montana County Noxious Weed Control Act requires landowners to control noxious weeds on their property. This is true for all landowners and not just mining property. In addition, the approved operating and reclamation plans for the MHM require operational noxious weed control.

TVX has implemented a noxious weed control plan approved by Park County and has been successfully controlling noxious weeds since 1986. The plan relies on chemical and mechanical weed control to kill weeds.

Current weeds on the mine site include isolated stands of Canada thistle and dalmatian toadflax. There are fewer weeds on the MHM permit area today than most of the surrounding lands because of the operational weed control efforts by TVX.

No reclamation bond is in place for operational weed control.

#### Existing Plan

The same weed control efforts would be conducted by TVX during the reclamation phase as throughout mine life. The existing reclamation plan approved for the MHM would be to revegetate almost all of the 69 acres of disturbance on the site. Some roads would be left through the mine site at closure (Figure 1-2). Most of the historic mining disturbances on the site would not be reclaimed and TVX is not required to reclaim these disturbances under the MMRA.

Reclamation of the disturbed lands would reduce the potential for noxious weed invasion over operational conditions. Heavy seeding rates would limit the potential for initial establishment of noxious weeds. However, the potential for continued future invasion of noxious weeds is high, even on reclaimed and revegetated lands as noxious weed populations continue to increase in surrounding areas. This is a largely unavoidable impact of disturbance. Two other noxious weeds, spotted knapweed and houndstongue are in nearby areas.

The soil replacement depth on the development rock piles in the Existing Plan, is a minimum of 8 inches thick, which would limit the potential plant community that could establish on the sites. These shallow infertile replacement soils over waste rock would favor invasion by species tolerate of infertile soils like noxious weeds. The soil replacement depth is thicker (12 inches) on the TSF. The TSF would produce a more productive plant community but it would still be open to noxious weed invasion. This is unavoidable even with thicker soil covers.

The lack of organic soil amendments in the existing reclamation plan would limit the potential for soil microbes to develop nutrient cycling (*Appendix B*).

A criterion for successful reclamation and revegetation would be the control of noxious weeds. The MMRA reclamation bond includes post-reclamation weed control costs as part of the revegetation bond amount. The bond would be held for at least five years and would not be released until the reclaimed disturbed areas are revegetated and noxious weeds are controlled on the MHM permit area to a level less than on surrounding lands in the area.

Noxious weed control efforts would continue under the Montana County Noxious Weed Control Act for the post-mine landowner of the property even though the reclamation bond would eventually be released. With a continual seed source available to invade the property, it is anticipated that noxious weeds would never be completely eliminated from the site.

#### Applicant's Proposed Plan

Weed control efforts in the Applicant's Proposed Plan would be the same as the Existing Plan but some improvements to the reclamation plan would reduce potential noxious weed invasion potential.

The seeding rate would be increased over the Existing Plan to promote a denser stand of vegetation, which could reduce the initial establishment of noxious weeds. Drill seeding for slopes less than 3:1 is also proposed to improve seedling establishment over the Existing Plan.

The species mix has been revised based on recommendations from Yellowstone National Park botanists and includes more native plant species. This may have a limited positive or even a slightly negative effect on the potential future invasion of the site by noxious weeds. Noxious weeds are able to invade native stands as well as introduced stands of vegetation in reclaimed communities and many native species require more time to become established than introduced species.

The reclamation plan for the development rock piles remains unchanged.

TVX has proposed importing soil to the site to provide deeper and better quality replacement soils on the TSF to reduce seepage out of the TSF. This would also increase revegetation success over the existing reclamation plan for the TSF by allowing deeper rooting species like Douglas fir to dominate on the site. The deeper soils would enhance productivity of post-mine plant communities but the potential would still exist for noxious weed invasion. Weed control efforts would have to continue into the future.

The importation of soil increases the potential for noxious weed introduction. TVX has imported soil from the Brogan gravel Pit near Corwin Springs, MT. DEQ personnel have inspected this pit in 2000 and found one dalmatian toadflax plant. The source of the dalmatian toadflax was the highway right-of-way adjacent to the pit. The National Park Service has certified the Brogan Pit as weed-free and gravel from the pit is used within Yellowstone National Park. DEQ approved the use of the Brogan Pit soil for TVX reclamation work conducted in 2000 because of this limited noxious weed presence and because dalmatian toadflax is already on the MHM site. DEQ also

checked to ensure that the Brogan Pit had enough soil stockpiled to meet its reclamation plan needs.

TVX would add organic amendments to enhance soil organic matter contents and to promote soil microbes and nutrient cycling. These soil building organic materials (other mineral soil, horse manure, wood chips, grass cuttings) have been imported to the site and are being tested for germination of noxious weeds. The applicant has stockpiled horse manure on site over the past two winters. Composting has occurred, and the material has sprouted vegetation. The stockpile has been surveyed for growth of noxious weeds, and none have been observed. Stockpiling these materials prior to use in the field has aided in determining the need for mitigating measures to control noxious weeds. Vegetation test plots have been installed on the site and monitoring of the vegetation growth has not documented any contamination by noxious weeds to date. Enhancement of the soil nutrient cycling system would help reclaimed plant communities compete with noxious weeds.

The bond release criterion for weed control would be the same as for the Existing Plan. The bond would be held for at least five years.

If the USFS assumes ownership of the property, the TVX bond would be released and the USFS would be responsible for continuing weed control efforts. If the site is managed and developed as a recreational, educational and historic interpretation site by the USFS, the increased access to the area could increase the potential of noxious weed invasion.

#### Agency Modified Plan

In the revegetation section (Issue 9), the agencies would modify the recommended seed mix and seeding rate based on recommendations from a revegetation review conducted on the site (*Appendix B*). Review of other reclamation on hard rock mines in Montana by Producers and others has shown little chance of survival for tree and shrub seedlings at sites with seed mixes and seeding rates similar to those proposed by TVX. The review recommended changes to help encourage more Douglas fir survival and growth and to encourage natural invasion of other native species. This is especially true on the TSF, which is dependent on the dominance by deeply rooted Douglas fir to dry out the site.

Unfortunately, reducing seeding rates and leaving the reclaimed plant community open to invasion by native species increases the risk of noxious weed invasion as well. Monitoring and control of noxious weeds would continue at least until the Douglas fir seedlings are well established. Weed control would have to be done by

spot spraying to prevent injury to desirable tree and forb species that do establish on the sites.

Initial erosion rates are not expected to be a problem with the reduced seeding rates because erosion has been limited, even operationally on the TSF without any revegetation.

The short-term risk of noxious weed invasion is considered less significant than the lack of Douglas fir establishment on the TSF would be. Dominance of the TSF by Douglas fir would reduce the long-term potential for water quality problems from TSF seepage. A dense stand of trees would reduce long-term noxious weed potentials on the TSF in the future.

The agencies would also change the use of manure as an organic amendment on sites that are meant to be dominated by tree and shrub species based on the review by Producers (Issue 9- Revegetation and *Appendix B*). Producers' research on hard rock mine sites across Montana has shown that fungi-dominated systems favor succession to conifers. Wood waste organic amendments favor fungi-dominated soil microbes. Manure-based organic amendments favor bacteria-dominated soil microbes and dominance by grasses (Producers, 2000a). DEQ would require TVX to use wood waste organic amendments especially on the TSF. This use of wood waste would help ensure the dominance by Douglas fir and reduce the long-term risk of noxious weed invasion on the TSF.

#### Cumulative Impacts

Revegetation of over 60 acres of the Mineral Hill Mine area would reduce the potential cumulative impacts of noxious weeds in the area over the operational potential impacts. The Darroch-Eagle timber sale, if approved, could increase the potential weed invasion above the mine site if the logging companies do not clean their rigs before accessing the site. Continued recreational uses of the area especially for hunting brings weed seeds to the area. The limited expansion of the T. Patrick O'Hara (TPO) travertine quarries approved in 2001 near Gardiner should have little cumulative impact on the weed problem in the area as long as TPO complies with its noxious weed control plan.

#### **Issue 11. Bond**

In concert with other laws, the Metal Mine Reclamation Act (MMRA) requires mining companies to return the land, water, and air to a state of comparable stability and utility. Reclamation must ensure that the post-mine environment is stable, and that the land can be used for the proposed post-mine land use while blending in with the surrounding area.

Since 1971, mining companies in Montana have been required to post a reclamation bond before an operating



permit can be issued. The reclamation bond is simply financial assurance that the costs to reclaim a mine site would be covered. It is much like an insurance policy, and it ensures that the land would be reclaimed, no matter what happens to the business future of the company.

The bond must be sufficient to cover the State's cost to close an operation and reclaim the site, if for any reason the mining company is not able to do so. It also includes contingency plans, and bonds associated monitoring activities required of a Permittee under the MMRA.

DEQ bonds for contingency plans to respond to reasonably foreseeable problems. Bonds also include estimated costs to DEQ which may arise from additional design work, applicable public contracting requirements or the need to bring personnel and equipment to the permit area after its abandonment by the permittee. Finally, the bonds include an additional amount based on factors of cost changes during the next 5 years for types of activities associated with the reclamation to be performed.

When calculating a bond, DEQ must consider the amount of land involved, the amount of mining disturbance at maximum build-out in the next 5 years, and the proposed reclamation plan. The agency then uses the best available and most current cost reference sources, software, equipment productivity data, current machinery production handbooks and publications or other documented costs acceptable to DEQ to calculate the bond. DEQ has updated its bonding procedures since the Pegasus Gold, Inc. bankruptcy has identified bonding shortfalls in certain reclamation tasks (DEQ, 2000d). Also, DEQ modified its bond forms in 2000 to correct some problems with bond cancellation timeframes, etc.

The reclamation bond would be used if:

- The applicant does not perform the work at all.
- The applicant does perform the work, but the performance does not meet expectations (e.g. the TSF produces more than 1.0 gpm of seepage).
- The applicant does perform the work, and it functions as planned, but maintenance, monitoring and replacement costs exceed expectations.
- The bond for reclaiming disturbed acres is held until reclamation is complete and revegetation is successful. Bond is not released before the public has had a chance to comment on the proposed release.

Reclamation bonds for operation, maintenance and water treatment on a site over long periods of time are calculated at an amount that would generate enough interest to operate, maintain and replace water treatment facilities and perform other maintenance of the site as needed. Bonds for water treatment are set at a level sufficient to treat contaminated water as long as needed or for 100 years.

Once an alternative is selected, DEQ would perform and complete a final bond review to ensure that reclamation would be completed. A preliminary bond calculation summary for each alternative is included in Table 3-7. Detailed preliminary bond calculations are available from DEQ in Helena.

#### Affected Environment

As provided by ARM 17.24.141(1) (Rules and Regulations Governing the Montana Hard Rock Mining Reclamation Act), the bonding amount for the Mineral Hill Mine is subject to review by the DEQ at least every 5 years. A 5-year bond review was completed on the site in early 1999. A summary of the existing bond is provided in Table 3-7. The bond calculation included costs for reclamation and 3 years for RO/evaporation treatment of TSF seepage. The bond was set up such that TVX could post the 3 years of water treatment bond in three increments and if satisfactory reclamation work had been completed each year additional increments would not be needed.

Currently, under Operating Permit 00100 DEQ holds \$7,607,202 in total bond for reclamation work and 1 year of water treatment for TSF seepage. TVX would have to complete additional reclamation by July 2001 or the bond would be increased by another \$1,124,400. TVX was successful in completing enough reclamation in 2000 to avoid the payment of an additional \$1,124,400 on July 1, 2000.

DEQ holds the TVX bond in the form of an irrevocable letter of credit. A letter of credit is an open line of credit drawn against the applicant and guaranteed by the issuing bank. Should the company fail to perform, the bank would back the credit line. This form of financial instrument is more liquid than a surety bond, which must be collected from an insurance company.

DEQ holds another letter of credit for \$100,000 to cover exploration disturbances under Exploration License 00559.

Also as provided in 82-4-338(2), MCA, the reclamation bond is subject to annual oversight reviews. DEQ completed an MMRA-required annual bond review in 1999 for the TVX mine and evaluated the need for additional bond for monitoring well MW-10 to treat a nitrate problem in the well. No bond was added at the



time, as the leaking process ponds were believed to be the most likely source of the problem. The ponds were reclaimed in 1999. While nitrate levels have stabilized, nitrate is still above standards in MW-10.

The 2000 annual bond review did not identify any immediate needs for additional bonding as this EIS for the Consolidated Closure Plan was projected to be released in early 2001.

The next mandatory 5-year bond review is not due until 2004. However, a full bond review would be conducted when a final decision is reached on a closure plan alternative in this EIS.

Ground water monitoring shows increasing trends in nitrate in wells near the TSF (EDE, 1999b). One well (HSMW-4B) also shows an increasing trend in arsenic. These trends do not appear to be correlated to mine activities. There is some evidence that the trends are correlated with increases in water level. The water level increases are probably climatically driven, though some increases are coincident with land application of large volumes of Crevice Adit water in 1995. Although coincident in time, the two areas are almost a mile apart and land application was undertaken at the mine site, not the TSF. DEQ included a bond for 5 years of water quality monitoring in a 5-year bond review completed in 1999.

No bond is currently held to construct bat closures for historic or current mine workings. Reclamation of historic works is exempted from MMRA bonding requirements. DEQ added the exploration license disturbances under the operating permit bond for this EIS.

Copies of the detailed existing bond calculation can be obtained from DEQ. The current bond includes 21% indirect costs (Table 3-7).

#### Existing Plan

The amount of the existing TVX reclamation bond is sufficient for reclaiming disturbed acres if DEQ were to implement the Existing Plan. This is especially true since additional acres were reclaimed in 2000. The bond does not include enough money for indirect costs and water treatment needed for water treatment facilities.

The Existing Plan anticipates natural processes would manage some aspects of reclamation (e.g. TSF seepage treatment). Since the MPDES permit was issued in 1996, it has been obvious that seepage would not meet water quality standards (DEQ, 1997). This assumption was modified in the 5-year bond review in 1999 and DEQ required a 3-year water treatment bond in case the

natural processes fail to limit water quality problems from TSF seepage (Table 3-7).

The existing bond contemplates treating 5.0 gpm of TSF seepage on a year-round basis in the existing RO/evaporation system. Mean annual flow in 1999 equaled 3.7 gpm (Figure 3.2). The TSF has continued to drain down with time. By the end of 2000, in the unreclaimed condition, the TSF was draining at a baseflow of 2.0 gpm. This is a decrease of 50 percent (2.0 gpm) in the past two years (*Chapter 3*, Issue 1 and Figure 3-2).

The Existing Plan bond was recalculated to cover operation and maintenance of water treatment facilities for 5 years. To be conservative, an average of 4.0 gpm of seepage was used in the Existing Plan bond recalculation for treating TSF seepage through the existing RO/evaporation water treatment plant to ensure TSF seepage meets water quality standards set in the MPDES permit.

Exploration License 00559 disturbances have been added to the recalculated bond. No contingency bond is held for treatment of Crevice Adit discharges since the adit would be plugged in the Existing Plan. Bond has been added to install the plug.

The recalculated bond does not include a contingency amount for in situ treatment of nitrates in monitoring well MW-10.

DEQ would hold a bond for at least 5 years to monitor the ground water trends in arsenic, nitrates, and water levels near the TSF.

No bond has been added for treatment of 1300 Adit water as no plan is proposed for treatment of the water if the Crevice Adit is plugged. If this closure plan alternative is selected, a plan would have to be submitted and a bond calculated.

No bond has been calculated as part of the Existing Plan to cover bat closures or their maintenance on historic openings. No bat closures are proposed for the permitted openings in the Existing Plan.

The recalculated bond totals \$4,206,040 for reclamation dirtwork and \$ 4,478,000 for water treatment costs. A summary of the recalculated Existing Plan bond is shown in Table 3-7. The bond includes 42 percent for indirect costs. The bond does include operation and maintenance of water treatment system costs for 5 years. This bond amount is subject to change based on comments received during the EIS process.

If the existing reclamation plan alternative is selected, TVX would have to post a replacement bond as a letter of credit or other accepted bonding instrument. If the

operator defaults, the bond converts to cash payable to the State.

Copies of the detailed recalculated Existing Plan bond can be obtained from DEQ.

#### Applicant's Proposed Plan

Modifications to the reclamation and water management plans necessitated a thorough review of the existing bond levels. Elements, as noted below, have been added to the reclamation and water management plans and would increase the bond:

- o TSF biological treatment system and wet meadow HDS for average-year precipitation and upland HDS for wet-year precipitation using a subsurface irrigation system. TSF seepage would be augmented with up to 15 gpm of Crevice Adit water. The water would meet ground water standards before it is subirrigated in the upland HDS system. The system is described in *Chapter 2, Issue 1* (Figure 2-6). The bond would include operating, monitoring, and maintenance costs for the system for 100 years;
- o Crevice Adit closure system including a bulkhead, HDS pipeline, Outfall 001 pipeline, and domestic/fire distribution system. The system is described in *Chapter 2, Issue 3* (Figure 2-7). The bond would include operating, monitoring, and maintenance costs for 100 years;
- o Soil manufacture systems using Brogan Pit imported soil, on-site alluvial borrow for subsoil, and organic amendments. The soil and organic amendments are described in *Chapter 3, Issue 9*;
- o Internal mine drainage diversion drilling on 1050 Level. Two existing drill holes would be enlarged and potentially cased (if needed during drilling) to allow gravity drainage between the 1050 Level and the 1200 Level. That is, all drainage from MHM would then be fed by gravity to the 1300 Adit;
- o More detailed requirements regarding location, use, and density of placement of tree and shrub tubing nursery stock; and
- o 1300 Adit water treatment system including a pipeline system to a chemical addition building and then to the existing septic drainfields. The system is described in *Chapter 2, Issue 4* (Figures 2-7 through 2-11). The bond would include monitoring,

operation, and maintenance costs for 100 years.

TVX has proposed to maintain the RO/evaporation treatment plant for the TSF seepage during the transition to the biological treatment system. The transition period is estimated to require a few months. DEQ would bond for 2 years at 4.0 gpm to be conservative.

DEQ assumes that the baseflow of 2.0 gpm from the TSF in an unreclaimed condition would reduce to 1.0 gpm or less after 5 years of plant growth on the reclaimed TSF. This is especially true since the storm water would be routed off the site.

A contingency bond would be posted for monitoring well MW-10 and for in situ remediation treatment to ensure the well complies with MPDES requirements. In the event ongoing monitoring shows that nitrate levels in monitoring well MW-10 remain above standards, and natural processes are insufficient to control the trend, in situ treatment would be appropriate.

The applicant has demonstrated that injection of a liquid carbon source (sugar) would accelerate growth of indigenous bacteria, which consume nitrate (EDE, 2000). Nitrate levels were reduced by 50 percent during a recent pilot test. This process accelerates natural remediation, and would only be appropriate if natural processes are unsuccessful in improving the situation. No contamination has been detected to any offsite resources, and the contamination is limited to the immediate area of MW-10. If the trend in nitrate concentration drops below 7.5 mg/L, no remediation bond would be required.

No contingency bond is needed for treatment of the Crevice Adit discharge as it meets water quality standards. Bond would just be held for operation and maintenance of the discharge systems for 100 years.

DEQ evaluated the proposed ferric sulfate coprecipitation treatment method for the 1300 Adit discharge. A full-scale pilot test was run by TVX with acceptable results. Bond would be needed for operation, maintenance and eventual replacement of the systems for 100 years.

Coprecipitation does not produce a significant amount of sludge like a lime treatment system. No additional bond was added for pumping and disposal of the septic tank sludge as part of the bond. The tank would continue to be pumped regularly by the landowner after closure and the treatment system would not add significant volumes of sludge requiring additional pumping.

Ground water monitoring would continue during closure and post-closure (AKI, 2000a, Appendix 10) to confirm that increases in nitrate, arsenic, and water levels in wells in the TSF area are natural and not mine related.

The recalculated bond does not include costs to cover the construction of an agency-approved bat grate on the Crevice Adit. TVX would have to construct the closure by the end of the 2001 field season or a bond would be assessed. No bond has been calculated as part of the Applicant's Proposed Plan to provide bat closures on eight historic openings.

DEQ has not bonded for construction of water treatment facilities in the bond. DEQ has given TVX a performance schedule to construct the treatment facilities. The systems must be constructed and tested before the end of the field season in November 2001 or a construction bond would be assessed.

DEQ has determined the approximate amount of additional reclamation bond required for the proposed Consolidated Closure Plan. The cost to complete reclamation work would be \$3,330,724. The bond for water treatment would be \$6,383,000 (Table 3-7). DEQ has bonded for 100 years of water treatment and operation and maintenance of water treatment facilities. This bond amount is subject to change based on comments received during the EIS process.

The TVX bond would be posted and would be in place until reclamation is completed, revegetation is successful and the bond is released. No bond would be released without an opportunity for public comment. TVX would be responsible for reclaiming all disturbances and construction of all water treatment systems before the bond would be released. If the land is donated to the USFS, the TVX long-term water treatment bond would be released and the USFS would assume all costs of maintaining the site.

Copies of the detailed bond calculations for the Applicant's Proposed Plan can be obtained from DEQ.

#### Agency Modified Plan

The bond for the Agency Modified Plan would be approximately the same as for the Applicant's Proposed Plan for reclamation. Bond for water treatment would be increased because of contingency plans added to ensure water quality standards are met.

TVX and DEQ have developed water treatment contingency options for TSF seepage and the 1300 Adit discharge (Figure 1, Appendix D). One scoping comment (Appendix A) suggested a risk analysis may be appropriate for issues such as the water balance cap reducing TSF seepage to 1.0 gpm or less. A risk

analysis might be appropriate if no contingency bond was posted.

No contingency bond is needed for treatment of the Crevice Adit discharge as it meets water quality standards. Bond would be held for operation and maintenance of the discharge systems for 100 years. Crevice Adit water would be used in other contingency options to treat 1300 Adit water and TSF seepage.

Two buried, gravity-driven pipeline contingency plans have been developed in the event that the TSF passive biological treatment system and HDS system are down for repair or maintenance (Figure 1, Options A and B, Appendix D). DEQ has bonded for operation and maintenance of the pipeline systems needed to operate these contingency plans.

TVX proposed in the CCP to add 15 gpm of Crevice Adit water to the upland HDS site to ensure the TSF seepage meets ground water standards. DEQ has increased the amount of Crevice Adit water that could be used as a contingency to up to 200 gpm (Figure 1, Option A, Appendix D).

A second contingency plan would require the addition of Crevice Adit water (up to 200 gpm) to the wet meadow HDS site for subsequent discharge to Bear Creek via an existing ephemeral drainage (Figure 1, Option B, Appendix D). This contingency would require a new MPDES Outfall 006 if ever used. Existing MPDES effluent limits could be met and the outfall could be permissible under MPDES rules.

The 1300 Adit water would be treated through ferric sulfate addition and discharge to ground water at Outfall 005 (Appendix C). If the treatment system was down for repairs or maintenance, Crevice Adit water (10-20 gpm) could be mixed with 1300 Adit water prior to discharge to ground water (Figure 1, TVX Option, Appendix D). This contingency could be permitted under the MPDES rules. TVX and DEQ developed another contingency that would add up to 190 gpm Crevice Adit water to the dosing tank if needed to meet ground water quality standards (Figure 1, Option C, Appendix D).

Another contingency plan for 1300 Adit discharge was developed in case the ferric sulfate treatment system was down for repairs. The pipeline from the 1300 Adit to the Crevice Adit pipeline would be buried and a gravity-fed discharge from the 1300 Adit Outfall 003 to Bear Creek at Outfall 001 would be used (Figure 1, Option D, Appendix D). This is the same as the Existing Plan discharge for 1300 Adit water. DEQ would bond for operation and maintenance of the contingency pipelines.

DEQ has added three new water-monitoring points. One would be for the 1300 Adit water before it is pumped from the dosing tank to ensure it meets ground

water quality standards. Another water monitoring point would be for the TSF seepage in wet years as it leaves the mixing box where it would be augmented with Crevice Adit water before it reports to the upland HDS. This would ensure that ground water standards are achieved before water is discharged to the upland HDS. The third monitoring point would be the contingency discharge point for the TSF seepage after mixing with Crevice Adit water in the wet meadow HDS if the TSF seepage system was down for repairs.

The nitrate, arsenic and water level trend ground water monitoring near the TSF would be bonded as in the Applicant's Proposed Plan.

The bond for the Agency Modified Plan totals \$3,395,000 for reclamation. The bond includes \$6,419,000 for 100 years of water treatment. A summary of the Agency Modified Plan bond is in Table 3-7. The bond includes 42 percent for indirect costs. The bond includes operation and maintenance costs for 100 years for water treatment facilities.

The bond also includes the cost of eventual reclamation of the water treatment facilities. This bond amount is subject to change based on comments received during the EIS process.

The Agency Modified Plan bond includes maintenance of bat grates on two current mine openings.

A copy of the detailed calculations for the Agency Modified Plan can be obtained from DEQ.

### Cumulative Impacts

There would be no cumulative impacts from other activities in the area with respect to the reclamation bond. Reclamation of historic disturbances in the area is not subject to bonding under the MMRA.

## **Issue 16. Ground Water**

### Affected Environment

The hydrogeologic setting has not changed from the time the original project EIS was released (DSL and USFS, 1986). A fracture controlled bedrock system underlies a vertically and laterally heterogeneous glacial/fluvial alluvium of varied thickness. The Mineral Hill deposit was a sulfide gold ore, which contained other accessory metals and metalloids, such as arsenic, tungsten, silver, iron, and manganese. Arsenic has been shown by soil and stream sediment sampling to be naturally high in the area underlain by the mineralized deposit (AKI, 2000a).

A recent tracer-injection study in Bear Creek conducted by the USGS showed that ground water contributes

arsenic to the stream particularly in the area of the historic arsenic mill. Cadmium and copper loads are contributed by seepage from the historic OTN tailings. No metal contamination from the TVX operation was indicated in the USGS study (Thamke, 2001).

Based on site monitoring data, background arsenic in ground water was calculated to be 0.036 mg/L. As a result of the evaluation of the water monitoring data, the MPDES permit has used a level of 0.036 mg/L for arsenic (*Appendix C*). Under Montana water quality standards, background becomes the standard when background exceeds the numeric standard. The numeric ground water standard for arsenic is 0.02 mg/L. The area background arsenic values are natural or related to historic mining activities, and not related to recent mining activities (EDE, 1999a).

Operationally, various water quality problems developed over the years. An MPDES permit was acquired for mine water discharges in 1996 (DEQ, 1997). Permitted discharges included the Crevice Adit, treated TSF seepage, and 1300 Adit discharge which were routed to surface water rather than ground water. Permit limits were established for protection of Bear Creek water quality, including total suspended solids (TDS), cadmium, copper, iron, manganese, lead, zinc, mercury, arsenic, and several nitrogen compounds. Three forms of cyanide are monitored. During the term of these permits, no limits have been exceeded.

Area surface and subsurface nitrate concentrations are generally less than 1.0 mg/L. The state ground water quality standard for nitrate is 10 mg/L. Ground water monitoring shows increasing trends in nitrate in wells near the TSF (EDE, 1999b). One well (HSMW-4B) also shows an increasing trend in arsenic. These trends do not appear to be correlated to mine activities. There is some evidence that the trends are correlated with increases in water level. The water level increases are probably climatically driven, though some increases are coincident with land application of large volumes of Crevice Adit water in 1995. Although coincident in time, the two areas are almost a mile apart and land application was undertaken at the mine site, not at the TSF.

DEQ bonded for 5 years of continued monitoring of the wells in the area as part of a 5-year bond review completed in early 1999.

Monitoring well MW-10 has shown nitrate values exceeding 10 mg/L for some time (EDE, 1999b, and EDE, 2000) and is the subject of an enforcement action. Under that action, TVX must determine the extent of nitrate contamination and mitigate the situation. Information obtained from drilling shows the contamination is very localized (EDE, 1999b). An in situ bioremediation technology involving the injection

of a carbon source into the well to facilitate the growth of indigenous nitrate reducing bacteria (EDE, 2000) has been tested and shows promise as a clean up option. Following removal of the process ponds in 1999, which were found to be leaking, nitrate levels in well MW-10 have begun to level off. Nitrate levels are still above standards. Continued monitoring is scheduled to identify whether the trend would increase, continue to slow or decline.

According to the Montana Department of Natural Resources and Conservation (DNRC) database, there are 24 wells that have received water rights appropriations within a two-mile radius of the operation. The two nearest to the MHM are the Foster and Skertich wells. No actual or potential impacts to these wells have been identified. No springs are located in or near the MHM permit boundary.

#### Existing Plan

No ground water management was included in the existing reclamation plan. The 1986 EIS (p. III-10) predicted two potential sources of ground water contamination: the TSF seepage and the mine workings (DSL and USFS, 1986). Mine workings were forecast to be a manageable source of potential contamination, and the TSF cap and seepage collection pond system were forecast to control long-term potential for seepage to ground water. No plan was in place to treat seepage from the TSF and no reclamation was proposed for the SCP.

If plugging the Crevice Adit was successful, surface water Outfall 001 would not be needed. The 1300 Adit discharge system would have to be modified because of the lack of Crevice Adit water for mixing. No plan was proposed for the 1300 Adit discharge. If this closure plan is selected, a plan would have to be developed and bonded. The TSF would continue to be treated via the RO/evaporation treatment system and discharged at Outfall 002.

Monitoring for nitrate contamination in monitoring well MW-10 would continue. Should the upward nitrate trend continue, bioremediation would commence. No bond has been calculated to cover the potential cost of this remediation.

DEQ has included the cost of bonding for 5-years of ground water quality monitoring in the Existing Plan bond recalculation to ensure the trend in arsenic, nitrates and water levels near the TSF are evaluated.

#### Applicant's Proposed Plan

TVX has proposed plans to reduce the amount of arsenic that is currently routed to Bear Creek.

Response to the well MW-10 enforcement action would be the same as that described in Issue11-Bond for the Applicant's Proposed Plan.

Continued monitoring of other ground water resources are planned as part of the proposed monitoring plan. The goal of this monitoring would be to verify that the mining and reclamation activities have not modified natural trends in ground water elevation and/or quality. Ground water monitoring would continue during closure and post-closure (AKI, 2000a, Appendix 10) to confirm that increases in nitrate, arsenic, and water levels near the TSF are natural and not mine-related.

Several additional ground water monitoring locations have been added to the existing water resources monitoring plan.

A biological treatment system has been proposed to treat seepage from the TSF, and the SCP would be reclaimed to a wet meadow HDS (Figure 2-6). In wet years, an upland HDS would be used to evapotranspire excess TSF seepage. The wet meadow and upland HDS discharges would not require MPDES outfalls. These sites are designed for evapotranspiration of water. TVX has added a contingency option to ensure water quality standards are met. Up to 15 mg of Crevice Adit water would be added to insure compliance with ground water standards (Figure 1, *Appendix D*).

No additional monitoring is proposed for the Crevice Adit water as it meets water quality standards and it would be routed to surface water (Figure 2-7).

The draft revised MPDES permit reflects the septic tank discharge of 1300 Adit water as Outfall 005 (*Appendix C*). Outfall 005 is a discharge to ground water. The applicable standards are the human health standard or background conditions whichever are highest. The only parameter that exceeds the human health standard in the discharge is arsenic. The human health standard for dissolved arsenic in ground water is 0.020 mg/L.

The effluent would be treated prior to discharge to a septic system, which includes a septic tank, dosing chamber, and two drainfields (Figures 2-7 through 2-11). The effluent would be treated by coprecipitation with iron prior to discharge to the septic tank. Preliminary data indicated that the effluent could be treated to approximately 0.02 mg/L dissolved arsenic. Arsenic precipitated with iron would settle out in the septic tank and dosing chamber.

The background concentration in the ground water was derived from the average of the average data from each of four monitoring wells. Wells 8 A, B, and C are a nested set of wells below the first drainfield and well



7B is located below the second drainfield. The average background value was 0.036 mg/L (EDE, 1999a).

The revised MPDES permit proposes that the 0.036 mg/L arsenic background concentration be set as the 30-day average limit (*Appendix C*). Until data can be assessed from the treatment system no instantaneous maximum limit would be imposed. Both the 30-day average and the need for an instantaneous maximum would be reevaluated during the reissuance of this permit in 5 years.

A yearly sample would also be collected from the effluent after discharge from the dosing tank and prior to discharge to the drainfields to ensure that precipitated arsenic is not being remobilized or being introduced into the system from other sources.

#### Agency Modified Plan

Additional ground water monitoring may be required under an UIC permit which could potentially be issued by EPA for the 1300 Adit discharge. DEQ would require additional monitoring of the effluent from the dosing tank before it is discharged to the drainfields to ensure ground water standards are met.

TVX and DEQ have developed two passive gravity-driven pipeline contingency plans to ensure ground water standards are met for the 1300 Adit discharge (Figure 1, Options C and D, *Appendix D*). These options would be used when the proposed treatment system is down for repairs or other maintenance.

Option C would add up to 190 gpm Crevice Adit water to the 1300 Adit discharge from the dosing tank to ensure ground water standards are met before the water enters the drainfield.

Option D would use a buried, gravity-driven HDPE pipeline from the 1300 Adit to the Crevice Adit buried gravity fed HDPE pipeline to mix the two sources of water for discharge at Outfall 001 as is currently being done under the existing MPDES permit.

A contingency bond would be held for in situ bioremediation, until nitrate concentrations drop below the standard of 10 mg/L in monitoring well MW-10.

To ensure ground water quality standards are met, DEQ and TVX developed two contingency plans for the effluent from the TSF (Figure 1, Options A and B, *Appendix D*). Both plans would include the addition of Crevice Adit water to achieve water quality standards in case the proposed treatment system is down for repair or maintenance.

Option A would add up to 184 gpm of Crevice Adit water prior to discharge to the upland HDS area

drainfield to ensure ground water standards are met before the water enters the drainfield. Option B would require mixing up to 200 gpm Crevice Adit water with treated TSF effluent in the wet meadow HDS, and the subsequent overflow would discharge to Bear Creek through an existing ephemeral drainage below the SCP. If the second option becomes necessary, a new Outfall 006 under the MPDES permit would be required (*Appendix C*).

Table 2-2 summarizes the old and new proposed MPDES permit for each discharge point. The overall affect of reclamation as described in this EIS as well as the conditions described in the revised MPDES permit would be to decrease the load of pollutants to Bear Creek (*Appendix C*). The original permit allowed a load of 0.629 lb/day of arsenic from the combined Outfall 001 and 003 plus 0.0032 lb/day from Outfall 002. All flows from the Crevice Adit, 1300 Adit and treated TSF seepage reported to Bear Creek.

The new MPDES permit would allow a discharge of arsenic of 0.1 lb/day from Outfall 001 for the Crevice Adit only. Outfall 003 has been redesignated as Outfall 005 to ground water for the 1300 Adit discharge. A total of 0.009 lb/day from Outfall 005 would report to ground water. The same total of 0.0032 lb/day from Outfall 002 for TSF seepage would be permitted but this would only be needed for 2 years until the biological treatment system met design criteria.

The new permit would result in a reduction of approximately 0.52 lb/day of arsenic or 82 percent of the current permitted discharge of for the entire mine area. The new permit would result in a reduction of the permitted arsenic reporting to Bear Creek of .529 lb/day or 84 percent. After 2 years, when the TSF biological treatment system meets design criteria, the arsenic reduction to Bear Creek would increase to 0.532 lb/day. Figure 3-7 shows the difference in permitted pollutant totals being discharged to Outfall 001 in the modified 1997 MPDES permit compared to the 2001 MPDES permit.

#### Cumulative Impacts

The reclamation of the site would improve ground water in the area. No other proposed activities in the area would cumulatively impact ground water resources.

#### **Issue 18. Wildlife-Bats**

##### Affected Environment

Bats could inhabit historic mine workings or current workings created as part of Operating Permit 00100 or Exploration License 00559 in Mineral Hill (Maxim



Technologies, Inc. 2000b). There is no documented evidence that bats utilize this potential habitat.

TVX evaluated the potential bat use of various openings in 2000 (Maxim Technologies, Inc., 2000b). No documented use was observed. No mining records exist that discuss the presence of bats in the workings by miners on the site over the years.

No bond is held for putting bat closures on the current mine workings at closure.

#### Existing Plan

No provision for protection or enhancement of existing bat habitat in the MHM adits was included in the Existing Plan.

TVX did consider bat closures at the request of the agencies in closure of several modern openings reclaimed as part of the Existing Plan in 2000. Based on consultation with Fish, Wildlife and Parks and other wildlife consultants, closure of modern adits to natural contours and the length of culvert needed through the fill would deter future bat use (Maxim Technologies, Inc., 2000b). The 450 and 750 Adits were not very suitable for bat use for these reasons (Maxim Technologies, Inc., 2000b). The 450 and 750 adits were backfilled with a concrete bulkhead and waste rock in 2000.

The First Chance Portal was closed with an agency approved bat closure in 2000 to preserve potential future access for the landowner and use of the workings by bats.

No cost has been included in the Existing Plan bond recalculation for bat closures.

#### Applicant's Proposed Plan

TVX has voluntarily proposed closure of 12 historic workings for safety reasons. TVX did propose eight bat closures on these workings. MMRA does not have any authority on closure of historic openings.

TVX did not propose bat closures on any current mine openings created as part of Operating Permit 00100. TVX has voluntarily agreed to put an approved bat closure on the Crevice Adit in the closure plan.

No bond has been calculated for the construction and maintenance of the bat closures on the First Chance Portal and Crevice Adit as part of the Applicant's Proposed Plan.

#### Agency Modified Plan

The DEQ could not require bat closures on any historic opening. TVX has agreed to consider bat gates on the historic openings to be closed as part of the Applicant's Proposed Plan. Metal gates designed to permit bat utilization would be installed in the entrances to eight of these historic workings based on the evaluation completed by TVX (Maxim Technologies, Inc., 2000b). A USFS bat expert would review the proposed closures for concurrence in case the property was donated to the USFS. The gates would comply with USFS and/or American Cave Conservation Association designs.

Bonding for closure of historic openings is outside the purview of MMRA.

Modern adits and vent raises to be closed for safety reasons were evaluated for closure with the same approved metal gates to preserve potential future use by bats. Of the 10 modern openings (i.e. six adits and 4 raises) created by TVX and to be closed by TVX, only the Crevice Adit and First Chance Portal would have bat closures. Other modern openings would not have bat closures because culvert lengths for maintaining bat access through the reclaimed pad areas are excessive. According to the evaluation by TVX (Maxim Technologies, Inc. 2000b), bats have historically been deterred by culverts. Potential bat habitat is poor, and stable reclamation of the portal areas is deemed more important than leaving the existing portals accessible to bat entry.

The USFS reviewed the proposed plans for closure of the modern adits to ensure they would meet with post-mine land use objectives for recreation, historical and educational programs (USFS, 2000). Based on that report, they recommend closure of the modern openings.

While not regulated or bonded under the MMRA, the gates that are installed on the historic adits would be monitored annually in accordance with USFS management plans if the USFS takes over management of the property.

Bond would be held for annual monitoring and eventual replacement of the bat closures over time for the First Chance Portal and Crevice Adit.

#### Cumulative Effects

No other proposed activities in the area could affect bat habitat. DEQ evaluated potential bat habitat in a cave as part of the T. Patrick O'Hara (TPO) travertine quarry expansion in 1999 (DEQ, 2000a). TPO voluntarily agreed to not get any closer to the cave as part of its operating plan.

## OTHER EFFECTS

### Regulatory Restrictions Analysis

MEPA, as amended, requires state agencies to evaluate any regulatory restrictions they propose on the use of an applicant's private property (75-1-201 (1)(b)(iv)(D), MCA). Actions proposed by the applicant and alternatives and mitigation measures designed to make the project meet the minimum requirements of state laws and regulations are excluded from evaluation.

Selection of the Existing Plan would not impose any new restrictions on TVX's use of its private property.

The Applicant's Proposed Plan contains new measures imposed by the State that would be needed to comply with water quality standards.

Most of the changes to the proposed action included in the Agency Modified Plan are needed to ensure that the proposed action would comply with state statutes and rules. Several minor requirements such as requiring TVX to maintain the bat gates would not be needed to comply with state statutes, but would impose minor costs to the company.

Should TVX donate the 556-acre claim block to the USFS, the mineral estate would be donated as well. Donated lands are classified as "acquired" lands under USFS regulations and are not subject to the 1872 Mining Law. The USFS has discretionary authority over allowing mining or not on acquired lands.

### APPLICABLE LAWS AND REGULATIONS

#### Agency Responsibilities

Laws that have been considered in preparing this EIS are listed below. Specific issues and concerns to be considered with regard to each law are contained in the issue specific discussion above.

#### Federal Laws

Based on the issues identified during scoping, the principal federal laws applicable to this proposal include the Clean Air Act and Clean Water Act. These are administered under State of Montana programs. No new air quality impacts were identified in scoping. The major water quality issues are Issues 1, 3, 4 and 16.

Another applicable law is the Endangered Species Act of 1973. DEQ considered this law in its evaluation of the closure plan. See the discussion in *Appendix A, Issue Disposition Summary* under Wildlife.

DEQ considered the National Historic Preservation Act and the Montana Antiquities Act in 1986 when the

project was permitted. TVX has a cultural resource management plan in place. The State Historic Preservation Office would be consulted as part of the proposed closure plan review process.

#### State Laws

##### Metal Mine Reclamation Act (MMRA)

The purpose of the MMRA (82-4-101 et seq.) is to ensure that the usefulness, productivity, and scenic value of lands and surface waters involved in mining and exploration receive the greatest reasonable degree of protection and reclamation to beneficial use. The Act and its implementing regulations (ARM 17.24.101 et seq.) set forth the steps to be taken and the reclamation measures that must be required in the issuance of an operating permit and approval of a reclamation plan for the MHM. The Act applies to private, federal and state lands within Montana. Under the provisions of MMRA, the Director of DEQ must decide whether to approve the applicant's proposed reclamation plan modifications, approve with modifications, or deny the modifications and enforce the Existing Plan. A bond is held to ensure reclamation plans are implemented.

##### Montana Environmental Policy Act (MEPA)

DEQ rules (ARM 17.4.601 et seq.) implementing the Montana Environmental Policy Act (MEPA) (Title 75, Chapter 1, MCA) require preparation of an EIS to analyze the impacts of major state actions. Major state actions include, but are not limited to, issuance of permits and modification of permits that could produce major environmental impacts.

##### Montana Antiquities Act

See National Historic Preservation Act, above.

##### Clean Air Act of Montana

The Air and Waste Management Bureau of DEQ administers the Clean Air Act of Montana (Title 75, Chapter 2, MCA). The applicant is required to comply with all air quality standards and thus, has obtained Air Quality Permit #2087-06. No additional air quality impacts have been identified in the scoping process.

##### Water Quality Act

DEQ is also responsible for administration of the Montana Water Quality Act (Title 75, Chapter 5, MCA), classifying surface waters, establishing surface water quality standards, and administering permit programs to control the discharge of pollutants into state waters.

A Montana Pollutant Discharge Elimination System (MPDES) permit or Montana Ground Water Pollution Control System (MGWPCS) permit is required before any discharge to surface water or ground water may occur. The applicant has obtained an individual MPDES permit (MT-0030252) for Outfalls 001 (Crevice Adit), 002 (treated TSF seepage), and 003 (internal discharge point for 1300 Adit drainage). The applicant has also obtained a general storm water permit (MTR300232) for industrial activities. As part of the reclamation activities, the applicant has a construction general storm water permit (MTR100000). TVX also has a Public Water Supply permit for the Jardine potable water system.

As part of the CCP, TVX would have to obtain authorization through a revised MPDES permit which would reflect outfall locations based on proposed reclamation activities (*Appendix C*). In addition, the Agency's Modified Plan contains three additional monitoring sites as well as contingency measures to ensure surface and ground water quality would be maintained.

#### Yellowstone National Park-State of Montana Compact

The applicant possesses valid well water right 43B-P-103111-00 for 50 gpm from the Crevice Adit. That water would be used for a potable water source, fire suppression, and irrigation purposes. This permit ensures that the well would not violate the Yellowstone Compact and protects geothermal resources.

#### Montana County Noxious Weed Control Act

The Park County Weed Board administers the Montana County Noxious Weed Control Act (7-22-2101 through 2153, MCA) for any disturbed lands within their jurisdiction. The applicant is required to submit a weed management plan to the Board for review and approval. TVX has an approved weed control plan.



# CHAPTER 4 - CONSULTATION AND COORDINATION

## THE PUBLIC INVOLVEMENT AND SCOPING PROCESS

### Public Notices and Outreach and Chronology of Public Participation Activities

On November 8, 1999 TVX submitted a draft Consolidated Closure Plan (CCP) for review by DEQ. On February 16, 2000 the CCP was formally submitted to DEQ. On March 6, 2000 TVX sent out a newsletter about a March 15, 2000 public meeting on the CCP. On March 7, 2000 DEQ sent out a press release about the upcoming March 1, 2000 public meeting on the CCP. The public meeting was held in Gardiner on March 15, 2000.

Based on comments received from the public meeting, DEQ prepared a scoping document, which was mailed out to the TVX mailing list and placed on the DEQ web page on April 4, 2000. April 24, 2000 was the official deadline for scoping comments, but comments have been accepted all through the EIS preparation process.

TVX sponsored a workshop to explain the CCP on May 22, 2000. TVX sent out a newsletter about the workshop on May 15, 2000. On May 22, 2000 TVX agreed to prepare an EIS on the CCP.

On May 24, 2000 a notice was sent out about a scoping meeting to be held on June 15, 2000. On May 25, 2000 DEQ and the FS agreed to be cooperating agencies on the EIS. On May 30, 2000 DEQ mailed out a second scoping document and an initial Issue Disposition Summary document. On May 31, 2000 DEQ placed the majority of the CCP on the DEQ web page. On June 8, 2000 the scoping document was placed on the DEQ web page. The scoping meeting was held on June 15, 2000 in Gardiner, MT.

On June 1, 2000 DEQ approved the First Chance Portal reclamation. On June 13, 2000 DEQ approved OTS removal, development rock pile and other miscellaneous reclamation. On June 14, 2000 TVX sent out a newsletter notifying the local community about the upcoming reclamation activities.

Agency scoping by an interdisciplinary team of specialists from DEQ and the USFS raised numerous questions throughout the process. Disposition of these issues is discussed in *Appendix A*. As a result of the evaluation in *Appendix A* several issues were analyzed in *Chapter 3*.

On December 12, 2000 DEQ called the application for the CCP complete. On February 9, 2001 DEQ sent out

a legal notice to the Livingston Enterprise formally announcing the receipt of the application and notifying the public of the upcoming EIS.

## AGENCIES, ORGANIZATIONS, AND INDIVIDUALS CONTACTED

Listed below are those agencies, organizations, and number of individuals who would be sent copies of the EIS as summarized from the TVX mailing list.

### Federal Agencies

National Park Service, Yellowstone National Park  
U.S. Environmental Protection Agency  
U.S. Fish and Wildlife Service  
USFS Gallatin National Forest, SO,  
USFS Gardiner Ranger District  
USFS Region 1 Office

### State Agencies

Environmental Quality Council  
Governor's Office  
Montana Dept. of Fish, Wildlife and Parks  
Montana Dept. of Natural Resources and Conservation  
Montana State Library  
State Historic Preservation Office

### Elected Officials

Park County Commissioners  
Montana Representative Joe Balyeat  
Montana Representative Bob Davies  
Montana Representative John Esp  
Montana Representative Cindy Younklin  
Montana Senator Lorents Grosfield  
Montana Senator Don Hargrove  
Montana Senator Jack Wells  
U.S. Representative Dennis R. Rehberg  
U.S. Senator Max Baucus  
U.S. Senator Conrad Burns

### Organizations & Local Agencies

Bear Creek Council  
Gardiner Chamber of Commerce  
Gardiner Community Library  
Gardiner School District  
Greater Yellowstone Coalition  
Jardine TVX Mine Citizens Advisory Committee  
Livingston Chamber of Commerce  
Livingston School District  
Montana Environmental Information Center  
Northern Plains Resource Council  
Park County Sheriff's Department

## Individuals & Businesses

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### DISTRIBUTION AND REVIEW OF EIS

#### Distribution

A legal notice of the availability of this EIS was published in the Bozeman Daily Chronicle and Livingston Enterprise in February 2001. Copies of the EIS were mailed to 113 persons, groups, local governments, or agencies that have expressed interest in the project. The mailing list was compiled using names and addresses from the following sources:

1. Parties who requested to have their names placed on the mailing list for the project.
2. Parties who have submitted written comments to date in the process.
3. Federal and state agencies consulted during preparation of the EIS.
4. Others who have historically expressed interest in this project.
5. The Jardine TVX Mine Citizens Advisory Committee mailing list.
6. DEQ's standard mailing list for EIS's.

#### Review

This EIS can be viewed at the following locations:

1. Gallatin National Forest, Supervisor's Office, Bozeman, MT.
2. Gardiner Ranger District Office, Gardiner, MT.

3. Yellowstone National Park Headquarters, Mammoth, WY.
4. Montana Department of Environmental Quality, Metcalf Building, Helena, MT.
5. Gardiner Public Library, Gardiner, MT.

Copies of this EIS can be obtained by writing or calling the Montana Department of Environmental Quality c/o Patrick Plantenberg, P. O. Box 200901, Helena, MT 59620, telephone (406) 444-4960; e-mail address [pplantenberg@state.mt.us](mailto:pplantenberg@state.mt.us). The EIS will also be posted on the DEQ web page: [www.deq.state.mt.us](http://www.deq.state.mt.us).

#### LIST OF PREPARERS

The DEQ employees listed in Table 4-1 comprise the Interdisciplinary Team that conducted the environmental analysis and prepared the disclosure document for this project:



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**DEIS**  
**TVX Mineral Hill Mine**  
*CONSOLIDATED CLOSURE PLAN MODIFICATIONS*

**TABLES**



Table 2-1. Issues Raised During Scoping

Issues to be Analyzed	Issues Not Analyzed in Detail
1. Tailings Storage Facility (TSF) – Biological Treatment System, Cap Design	1. TSF – Stability
3. Crevice Adit Water System Design	2. Historic Structures and Features
4. 1300 Adit Drainage	6. Reclamation Schedule
5. Long-Term Monitoring and Maintenance	8. Water Rights
7. Future Land Use	12. Old Tailings South
9. Revegetation	13. Development (waste) Rock Piles
10. Noxious Weeds	14. Soil, Borrow, and Organic Matter Sources
11. Bond	15. Roads
16. Groundwater	17. Other Mining District Disturbances
18. Wildlife – Bats	18. Wildlife
	19. First Chance Portal
	20. Mineral Hill





Table 2-2. Comparison of Alternatives

FEATURES	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
<b>ISSUE 1 – TAILINGS STORAGE FACILITY (TSF) – BIOLOGICAL TREATMENT SYSTEM, CAP DESIGN AND STABILITY</b>				
<b>Disturbed Acres</b>	Total disturbed acres to date under the operating permit include 14 acres for the TSF. With the old tailings south (OTS), borrow area and other miscellaneous disturbances the total disturbance is about 33.1 acres. There are about 25 acres left to reclaim.	The total permitted disturbance for the TSF area is 55 acres. The existing disturbance of about 33.1 acres would not increase.	Same as Existing Plan.	Same as Existing Plan.
<b>Reclamation Plan</b>				
<b>Old Tailings South (OTS) Area</b>	The OTS tailings were moved to the TSF in 2000. The underlying soils were sampled and the contaminated soils were removed and placed on the TSF. Clean backfill was imported to reestablish the contour. A minimum of 8 inches of soil was replaced and seeded.	OTS tailings would be excavated and moved to the TSF. The underlying soil would be used as the plant growth medium. TVX reclaimed the area to a higher standard in 2000 as described in Operational Conditions.	Same as Existing Plan.	Same as Existing Plan.
<b>TSF Regrading</b>	The upstream TSF (north facing) slope was regraded to slopes that range from 4:1-6:1 in 2000.	TSF slopes would be regraded to slopes less than 4:1. TVX regraded the TSF slopes to meet this specification in 2000.	Same as Existing Plan.	Same as Existing Plan.
<b>TSF Reclamation Cap</b>	TVX placed contaminated soils from beneath the OTS and 18 inches of clean alluvial borrow material as subsoil in 2000.	The TSF would be capped with 9 inches of compacted, bentonite-amended tailings, 3 inches of a gravel drain layer, and finally 12 inches of soil (15 inches total cover over tailings).	Compacted tailings would be capped with 36 inches of alluvial borrow material subsoil and 12 inches of soil (total of 48 inches of growth medium over tailings). No clay is included in the design.	Same as Applicant's Proposed Plan.
<b>TSF Seepage Collection Pond</b>	NA	The tailings seepage collection pond (SCP) would be left as a small lake. The existing Montana Pollutant Discharge Elimination System (MPDES) permit regulates the discharge of the TSF seepage after treatment by reverse osmosis (RO)	Seepage water would be treated in a contained biological treatment system. Outflow from this system would gravity flow to a wet meadow habitat development site (HDS) for evapotranspiration, and in wet	Final designs would be submitted to DEQ for review and approval. Monitoring of the mixed Crevice Adit/wet meadow HDS overflow water would be required. DEQ and TVX developed two

Table 2-2. Comparison of Alternatives

FEATURES	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
		through Outfall 002. The RO brine is evaporated. No plan was proposed for TSF seepage after reclamation of the site.	years (estimate: 1 in 20 years) the seepage would be pumped and mixed with Crevice Adit water for additional evapotranspiration at the upland HDS. The system would have zero discharge, and the MPDES Outfall 002 would be eliminated after the biological treatment system meets design criteria. DEQ has bonded for 2 years at 4.0 gpm to be conservative.	contingencies: Option A would add Crevice Adit water to the TSF seepage before it enters the upland HDS site if the water does not meet ground water standards. Option B would be to add Crevice Adit water to the TSF seepage in the wet meadow HDS and the overflow would report to an ephemeral drainage for discharge to Bear Creek. This would require a new Outfall 006, if ever used. These options would be available when the TSF seepage treatment system was shut down for repair or maintenance.
<b>TSF Seepage Treatment System</b>	Pump TSF seepage to water treatment plant and discharge to Bear Creek at MPDES Outfall 002 after RO/evaporation. RO brine is evaporated.	No plan for treatment proposed.	A zero discharge facility is proposed consisting of a passive four-step biological treatment system and wet meadow HDS. In wet years, any surplus seepage would be pumped to an upland HDS, mixed with Crevice Adit water and applied at agronomic rates.	Same as Applicant's Proposed Plan, plus TVX and DEQ have developed two gravity-driven contingencies. Option A would add Crevice Adit water to the TSF seepage pipeline before water enters the upland HDS to ensure water meets ground water standards before application. Option B would feed Crevice Adit water directly into the wet meadow HDS. Overflow would gravity flow to an ephemeral drainage and discharge to Bear Creek in new Outfall 006. These options would be available if the other system was down for maintenance or repair.

Table 2-2. Comparison of Alternatives

FEATURES	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
<b>Cap Design</b>				
<i>Type of Design</i>	NA	Water Barrier	Water Balance	Same as Applicant's Proposed Plan
<i>Maintenance Requirements</i>	NA	Remove woody vegetation from TSF.	No removal of woody plants proposed. Woody plants planted.	Same as Applicant's Proposed Plan.
	Maintain surface pipelines, SCP, RO/evaporation system, and high volume and head pump to treatment plant.	No long-term system for TSF seepage proposed.	Maintain biological treatment system and buried gravity-flow pipelines, and a smaller pump from wet meadow HDS to upper HDS.	Same as Applicant's Proposed Plan and maintain contingency gravity-fed pipelines.
<b>Monitoring</b>	Monitor ground water quality in wells. Monitor surface water in Bear Creek, the SCP, TSF seepage, and RO effluent.	Same as Operational Plan.	More ground water monitoring sites proposed plus biological treatment system effluent. RO/evaporation system would be monitored until biological treatment system design criteria are met. DEQ has bonded for 2 years of RO.	One more monitoring site added for biological treatment system after mixing with Crevice Adit water prior to upland HDS application.
<b>Water Quality</b>	Seepage does not meet water quality standards for cyanide, arsenic, sulfate, manganese, nickel, zinc and iron without RO treatment.	Same as operational quality.	Same as operational quality.	Same as operational quality.
<b>Water Quantity</b>	Actual flow: 2 -60 gpm average 3.0 gpm (included storm water until fall 2000)	Predicted flow: 0.005-0.85 gpm average 0.22 gpm (storm water routed off site)	Predicted flow: 0-0.78 gpm average 0.14 gpm (storm water routed off site)	Same as Applicant's Proposed Plan.
<b>Erosion</b>	Best Management Plans (BMPs) in place to control wind and water erosion.	BMPs stay in place until vegetation establishes.	Same as Existing Plan.	Same as Existing Plan.

Table 2-2. Comparison of Alternatives

FEATURES	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
<b>MPDES Permit Requirements</b>	Permit Needed for Outfall 002 to Bear Creek after RO treatment of TSF seepage to dispose of treated TSF seepage and process pond water. Limits set by MPDES permit.	Process ponds were reclaimed in 1999. No plan for TSF seepage in Existing Plan. Flow would reduce to 1.0 gpm maximum and 0.22 gpm average.	TSF seepage would report to Outfall 002 until 2002. After TSF seepage dropped to less than 1.0 gpm, the biological treatment system would treat the water and there would be no discharge to Bear Creek.	Same as Applicant's Proposed Plan. Two contingencies were added to ensure a water treatment plan was in place during maintenance and repair of biological treatment system. Option B would require a new Outfall 006, if ever used.
<b>TSF Stability Measurement of Effects</b>	NA	No measurement proposed in Existing Plan.	Slope angles are equal to or less than those in Existing Plan and as depicted in Figure 2-5 in CCP for reclaimed topography. Rilling and gullyng have not occurred. Test by visual inspection during closure until bond is released.	Same as Applicant's Proposed Plan.
<b>TSF Seepage Measurement of Effects</b>	NA	None proposed in plan. MPDES would have to be modified if this alternative is selected.	TSF seepage is less than 1.0 gpm and the biological treatment system is achieving water quality criteria in MPDES permit. Monitor inflow and outflow of biological treatment system. TVX added one option to add Crevice Adit water to ensure ground water standards are met at upland HDS.	Same as Applicant's Proposed Plan. Add one monitoring point before water enters upland HDS in wet years. TVX and DEQ added two contingencies to add Crevice Adit water if standards are not met at upland HDS or wet meadow HDS (Figure 1, Option A and B, <i>Appendix D</i> ).
<b>Bond (see Issue 11)</b>	3 years of RO/evaporation water treatment for TSF seepage has been bonded.	The recalculated bond includes 5 years of RO treatment for TSF seepage.	Water treatment figured for 100 years using biological treatment system and HDS for TSF seepage.	Same as Applicants Proposed Plan plus TSF seepage water treatment contingency options A and B bonded (Figure 1, Options A and B, <i>Appendix D</i> ).
<b>ISSUE 3 – CREVICE ADIT WATER SYSTEM DESIGN</b>				
<b>Reclamation Plan</b>	NA	The Crevice exploration Adit was to be "...sealed, as appropriate... and an appropriate portal plug would be installed." Water would back up in the workings. TVX has submitted a conceptual	No hydraulic plug would be placed in the adit. Drill holes that produce most of the discharge water would be plugged. A gravity system of buried pipelines would deliver ≤	Same as Applicant's Proposed Plan. Final designs would be submitted to DEQ. DEQ added contingency diversion of Crevice Adit flows to be used for backup treatment of 1300

Table 2-2. Comparison of Alternatives

FEATURES	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
		design for the hydraulic plug.	50 gpm to the fire and potable water use systems in Jardine, and 135-200 gpm would discharge in Bear Creek. A portion of the Crevice Adit water would be available at the upland HDS to mix with TSF seepage. A security/bat grate would be installed in the portal.	Adit discharge and TSF seepage if needed during shutdown of those treatment systems for maintenance or repairs.
<b>Water Quality</b>	The Crevice Adit discharge meets all water quality standards with no water treatment.	Same as Operational Conditions.	Same as Operational Conditions.	Same as Operational Conditions. No contingency treatment needed.
<b>Water Quantity/Flow</b>	<400 gpm	Some minimal seepage around adit plug.	135-200 gpm	Same as Applicant's Proposed Plan.
<b>Jardine Water System</b>	<50 gpm	0 gpm	<50 gpm	Same as Applicant's Proposed Plan.
<b>MPDES Permit</b>	Outfall 001 to Bear Creek for 1,300 gpm of Crevice Adit and 1300 Adit discharges.	MPDES Permit is not needed.	MPDES Permit would be modified to 200 gpm of Crevice Adit water only.	Same as Applicant's Proposed Plan.
<b>Water System Maintenance</b>	Both pipelines to Bear Creek and to the Jardine fire system are surface high-density polyethylene (HDPE) lines.	No maintenance required.	Both lines would be buried, gravity-flow HDPE pipelines built to municipal water line standards which require limited maintenance.	Same as Applicant's Proposed Plan.
<b>Monitoring</b>				
<b>Flow</b>	Routine inspections are made for leaks by walking the lines. Monitor per MPDES Permit.	No monitoring proposed.	Monitor per revised MPDES permit.	Same as Applicant's Proposed Plan.
<b>Quality</b>	Monitor per MPDES and Public Water Supply permits.	No monitoring proposed.	Monitor per revised MPDES and Public Water Supply permits.	Same as Applicant's Proposed Plan.
<b>MPDES Permit</b>	MPDES permit Outfall 001 is needed.	Outfall 001 would be not needed if this alternative is selected.	A revised MPDES Permit Outfall 001 would be needed.	Same as Applicant's Proposed Plan.
<b>Bat Habitat</b>	No bat use has been documented.	No habitat would be available when the adit is plugged.	Bat grate would be installed on adit.	Same as Applicant's Proposed Plan.

Table 2-2. Comparison of Alternatives

FEATURES	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
Bond (see Issue 11)	\$56,000	No plug maintenance proposed. Recalculated bond includes the cost of plug installation. Bond \$700,000	\$15,000/year operation and maintenance; \$7,500 every 5 years for replacement costs.	Same as Applicant's Proposed Plan. No bond for contingency needed.
<b>ISSUE 4 – 1300 ADIT DRAINAGE</b>				
Reclamation Plan	The 1300 Adit is a historic opening that was constructed before Operating Permit 00100. The flow from the adit was impacted by modern mining above it.	The historic 1300 Adit drainage was not considered in the existing reclamation plan. The existing MPDES permit regulates the discharge to Outfall 003 and mixing with Crevice Adit water. The Crevice Adit would be plugged. No system was proposed to treat 1300 Adit water after plugging.	A frost-free inlet would be installed in the 1300 Adit, which would feed a buried gravity-flow pipeline to a ferric sulfate chemical addition building, prior to reaction and settling in the existing septic tank. From the dosing tank the treated water would be infiltrated via the two existing leach fields. A ground water Outfall 005 would replace the internal MPDES Outfall 003 in the existing septic system on site. TVX added an option to add 10-20 gpm of Crevice Adit water to dosing tank before discharge to ensure ground water standards are met.	DEQ added a site to monitor treatment of effluent prior to discharge. Final designs for the treatment system would be submitted to DEQ for review and approval. DEQ and TVX developed two gravity-flow, passive treatment contingencies: Option C would add up to 190 gpm of Crevice Adit water after the chemical addition building in case water did not meet ground water standards; Option D would bury the existing pipeline which connects the Crevice Adit pipeline to Outfall 001.
Water Quality	Outfall 003 arsenic exceeds surface water standard but is treated through mixing with Crevice Adit water and discharged to Bear Creek at Outfall 001.	No plan is proposed for treating 1300 Adit water when the Crevice Adit is plugged.	Arsenic would be treated through chemical precipitation by adding ferric sulfate. Water meeting ground water standards would be discharged at Outfall 005 in the existing community septic system and drainfields.	Same as Applicant's Proposed Plan.
	Arsenic level 0.5-0.6 mg/L.	Same as Operational Conditions.	Same as Operational Conditions.	Same as Operational Conditions.
Water Quantity/Flow	15 gpm	Same as Operational Conditions.	Same as Operational Conditions.	Same as Operational Conditions.
MPDES / Underground Injection Cell (UIC) Permits	The current MPDES Outfall 003 for 50 gpm (now 15 gpm) of 1300 Adit discharge is mixed with up to 1,300 gpm (now 354 gpm) Crevice Adit water and discharged at	No treatment system has been proposed to treat the current 15 gpm flow.	A revised MPDES permit is needed for ground water Outfall 005 in the existing approved septic tank drain field. TVX would also have to obtain	Same as Applicant's Proposed Plan. Two contingencies have been developed for Crevice Adit water additions to 1300 Adit flows. Option C would



Table 2-2. Comparison of Alternatives

FEATURES	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
	Outfall 001 in Bear Creek.		authorization under the EPA UIC program. TVX has developed a contingency option to add 10-20 gpm of Crevice Adit water to ensure ground water standards are met.	add Crevice Adit water before the drainfield to ensure ground water standards are met. Option D would construct a gravity-flow, buried pipeline from Outfall 003 to the Crevice Adit pipeline which would discharge at Outfall 001 in Bear Creek as is the current operational condition.
<b>Water System Maintenance</b>	Surface, gravity-flow HDPE pipeline to the Crevice Adit surface pipeline.	No treatment system is proposed.	Maintenance would be required for the chemical addition system and buried HDPE pipeline as well as one metering pump.	Same as Applicant's Proposed Plan plus maintenance of two contingency gravity-flow pipelines and valves would be needed.
<b>Monitoring</b>				
<i>Flow</i>	Flow is monitored per MPDES permit Outfall 003 and 001.	No monitoring plan is proposed.	Flow would be monitored per revised MPDES Outfall 005 and/or UIC permits (See <i>Appendix C</i> ).	Same as Applicant's Proposed Plan plus two contingency systems using Crevice Adit water (Figure 1, Options A and B, <i>Appendix D</i> ).
<i>Quality</i>	Quality is monitored per MPDES permit Outfall 003 and 001.	No monitoring plan is proposed.	Quality would be monitored per revised MPDES Outfall 005 and/or UIC permits (See <i>Appendix C</i> ).	Same as Applicant's Proposed Plan plus an additional monitoring site after coprecipitation and before discharge from the dosing tank.
<b>Bond (see Issue 11)</b>	No current bond is held for 1300 Adit discharge.	No bond has been calculated for an unknown system. If this alternative is selected, a treatment plan and bond would have to be developed.	System would have to be constructed by Nov. 2001 or bond would be assessed. Operation And Maintenance bond \$17,250/year; Replacement bond \$5,000/5 years and another \$5000 every 20 years.	Same as Applicant's Proposed Plan. No contingency bonds for O&M for two gravity-fed pipelines.

Table 2-2. Comparison of Alternatives

FEATURES	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
ISSUE 5 – LONG-TERM MONITORING AND MAINTENANCE				
<b>Monitoring</b>				
<b><i>Monitoring Plan Summary</i></b>	Operational monitoring plan has been modified as needed over the years.	Operational monitoring program under operating permit would continue until bond is released. Reclamation monitoring would be conducted, but no specific post-closure monitoring plan was proposed.	A detailed closure and post-closure hydrologic monitoring plan, designed to measure reclamation success, would be implemented. A conceptual revegetation monitoring plan is proposed.	Methodology for detailed revegetation monitoring would be required. Three additional hydrologic monitoring points would be added for water treatment contingency plans: (after the 1300 Adit chemical addition building, after the upland HDS mix box, and after TSF seepage and Crevice Adit water overflows the wet meadow HDS). Annual monitoring of bat gates on two modern openings would be added to the plan.
<b><i>Hydrologic (surface water, ground water, process water, storm water)</i></b>	Approved plans are in place under the MPDES, operating permit, Public Water Supply permit and storm water permit (SWPPP).	Same as operational monitoring. Monitoring would continue for 5 years under operating permit. No detailed plan for long-term closure monitoring is proposed. The MPDES plan would have to be revised, and SWPPP would no longer be needed after vegetation is established and erosion is controlled.	A detailed proposed plan for confirmation monitoring of reclamation success has been proposed. TSF seepage would be treated in RO unit until HDS is constructed and seepage drops to 1.0 gpm. The MPDES monitoring plan would be revised ( <i>Appendix C</i> ). SWPPP monitoring would be the same as Existing Plan.	Same as Applicant's Proposed Plan except three additional monitoring points would be added to identify need for Crevice Adit water addition in contingency systems (Figure 1, Options A-D, <i>Appendix D</i> ).
<b><i>MPDES outfalls</i></b>	Three outfalls (001 and 002, 003) currently in MPDES permit.	Outfall 001 for Crevice Adit water would no longer be needed. Outfall 002 for TSF seepage would still be needed. No plan proposed for 1300 Adit Outfall 003.	Three outfalls would still be needed: 001, 002 (only until 2002), and 005 for 1300 Adit discharge.	Same as Applicant's Proposed Plan plus a contingency developed that may need a new Outfall 006 to Bear Creek for TSF seepage.
<b><i>Revegetation</i></b>	No operational monitoring of revegetation is in the plan. TVX did some canopy cover monitoring for SWPPP and for Consolidated Closure Plan to collect some data	The Existing Plan would measure species composition and biomass on TSF annually for 5 years. A success criterion of 80 percent canopy cover under SWPPP for the old tailings	The proposed plan would monitor plant communities until 80 percent canopy cover is achieved and second-year biomass production of 715	DEQ would require additional revegetation and monitoring plan changes especially on TSF to ensure dominance by Douglas fir and shrubs per

Table 2-2. Comparison of Alternatives

FEATURES	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
	on reclaimed plant communities.	north (OTN) has been achieved.	pounds/acre (lb/acre) predicted in the EDYS model has been achieved.	Proddgers' (2000b) review recommendations ( <i>Appendix B</i> ).
<i>Noxious Weeds</i>	Regular field inspections for weeds are conducted during the growing season. Weed control conducted based on approved Park County Weed Control Plan.	No specific additional monitoring plans have been proposed and the Park County plan would continue.	Same as Existing Plan with additional monitoring for noxious weeds due to the importation of soil and organic amendments.	Same as Applicant's Proposed Plan.
<i>Erosion</i>	Regular visual inspections of BMPs are conducted per SWPPP and operating permit requirements.	Same as operational monitoring until reclamation is completed.	Same as Existing Plan. Bond includes erosion control repair costs until bond is released.	Same as Applicant's Proposed Plan.
<i>Term of Monitoring</i>	NA	Monitoring would continue during operations and closure for the operating permit until bond is released. SWPPP monitoring would continue until vegetation equals 80 percent canopy cover. MPDES water monitoring would continue as long as permit is needed.	Same as Existing Plan. Bond includes monitoring for 100 years or until bond release.	Same as Applicant's Proposed Plan.
<i>Bat Presence, Habitat and Bat Grate Monitoring</i>	No bat presence or habitat has been documented to date.	No monitoring of bats or their habitat is proposed. One bat grate was voluntarily placed on the First Chance Portal in 2000 by TVX at the request of the agencies. No monitoring of the grate is proposed.	Same as Existing Plan plus TVX agreed to place a bat grate on the Crevice Adit at closure. No monitoring proposed for the bat grate by TVX.	TVX has voluntarily agreed to place grates placed on eight historic openings based on review by DEQ and USFS. The grates on the Crevice Adit and First Chance Portal would be inspected annually for integrity.
Maintenance				
<i>Crevice Adit and Water Management System</i>	Site is inspected daily for access and water management system is checked for leaks. Repairs are made as needed.	The adit would be plugged. No plan for monitoring or maintenance of the plug has been proposed.	Site would be inspected weekly for access, and water management system would be checked for leaks. Repair would be made as needed. Bond includes operation and maintenance for 100 years.	Same as Applicant's Proposed Plan.

Table 2-2. Comparison of Alternatives

FEATURES	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
<i>1300 Adit Water Treatment System</i>	Site is inspected daily for flows and repairs are made as needed under MPDES permit.	No monitoring is proposed in the Existing Plan. The MPDES permit would have to be revised.	Inspect system weekly and repair as needed and restock ferric sulfate. Bond includes operation and maintenance of system for 100 years.	Same as Applicant's Proposed Plan.
<i>TSF RO Treatment System</i>	Inspect, monitor, and maintain the RO/evaporation system daily. The RO system is run for a 10-hour shift 5 days per week.	Same as operational system. No long-term plan is proposed for TSF seepage under the operating permit.	Same as Operational Conditions using the RO system until the biological treatment system meets the design criteria. The RO 2- year contingency bond would be held until biological treatment system meets design criteria.	Same as Applicant's Proposed Plan.
<i>TSF Biological Treatment System</i>	NA	NA	System would be inspected weekly and to restock reagents. Repairs would be made as needed. Bond calculated for operation and maintenance for 100 years.	Same as Applicant's Proposed Plan plus DEQ added monitoring after the TSF seepage/Crevise Adit water mix box, and after TSF seepage mixes with Crevise Adit water in wet meadow HDS.
<i>Jardine Water Supply System</i>	System is inspected daily and repaired as needed.	Jardine would have to develop a new system after the Crevise Adit is plugged.	System would be inspected weekly and repaired as needed.	Same as Applicant's Proposed Plan.
<i>Historic District</i>	Historic district not regulated under the operating permit.	Same as Operational Conditions.	Same as Operational Conditions.	Same as Operational Conditions.
<i>Revegetation and Erosion</i>	Visually inspect and repair seedings as needed.	No long-term monitoring plan is proposed in the operating permit.	TVX would have to maintain 80 percent canopy cover and control erosion until bond is released.	DEQ would require TVX to modify the revegetation and monitoring plan per Producers' (2000b) recommendations (Appendix C)
<i>Surface Water Quality Measurement of Effects</i>	MPDES requirements must be met.	Same as Operational Conditions.	Monitor Bear Creek upstream and downstream during and for 100 years after reclamation. Results would be compared to pre-mining and operational periods. USGS conducted a one-time stream tracer study to	Same as Applicant's Proposed Plan.

Table 2-2. Comparison of Alternatives

FEATURES	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
			identify any residual points of groundwater discharge to Bear Creek carrying pollutants and ascertain their quality, quantity, and source (Thamke, 2001).	
<i>Bond (see Issue 11)</i>	Three years of operation and maintenance is in existing bond for TSF seepage RO/evaporation treatment system.	The recalculated bond has 5 years of operation and maintenance in water treatment bond for TSF seepage RO/evaporation treatment system.	Operation and maintenance of all water systems would be bonded for 100 years.	Same as Applicant's Proposed Plan. Contingencies not bonded for operation and maintenance.
<b>ISSUE 7 – FUTURE LAND USE</b>				
<b>Public Access to Patented Property</b>	Public access is allowed through the property on the Bear Creek road. No public access is allowed on property.	Same as Operational Conditions.	Controlled public access would occur if USFS assumes the property.	Same as Applicant's Proposed Plan.
<b>Health and Safety Issues for Use</b>	Six historic potentially hazardous openings have been closed. The historic arsenic mill and cyanide leach plant have been reclaimed. The 1300 Adit historic flow is being treated under a MPDES permit. Monitoring well MW-10 has elevated nitrates and is being monitored.	No closure of historic openings was proposed. The process ponds and the metal-laden pond sludge have been removed. The historic OTN and OTS tailings have been reclaimed. Almost all 69 acres disturbed under Operating Permit 00100 would be regraded, soiled, and revegetated. No treatment plan for TSF seepage has been proposed. The exposed contaminated water in the SCP would not be reclaimed. A revised MPDES for 1300 Adit discharge would be needed.	Twelve potentially hazardous historic openings would be closed (six have been completed to date). TSF seepage would be treated. The SCP would be reclaimed to a wet meadow HDS. Bond has been added to remediate the monitoring well MW-10 nitrate problem if needed.	Same as Applicant's Proposed Plan.
<b>Land Use Potential</b>				
<b>Proposed</b>	Operational land uses include: mining, staff housing, wildlife habitat, grazing and water quality protection. No recreation has been permitted on the mine site. Public access is allowed through the property on the Bear Creek road.	Post-mine land uses include dispersed recreation on the reclaimed mine site, wildlife habitat, water quality protection, hunting, logging, and tourism.	Same as Existing Plan.	Same as Existing Plan.
<b>Future</b>	NA	Same as proposed land uses, but also the potential exists for future mining.	Same as Existing Plan. If the USFS takes over the property,	Same as Applicant's Proposed

Table 2-2. Comparison of Alternatives

FEATURES	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
		residential subdivision, etc. after the bond is released.	land use would be managed by the USFS. Land uses would include more recreation, education and historical interpretation. The property would not be available for mining or residential subdivision.	Plan.
<i>Jardine Historic District</i>	Mitigation plan is in place under operating permit that precludes disturbance of historic structures.	Same as Operational Conditions.	Same as Existing Plan. If USFS takes over property, management of the historic district would revert to the USFS. A restoration plan has been developed.	Same as Applicant's Proposed Plan.
<i>Jardine Water System</i>	A Crevice Adit well source is used for the Jardine potable and fire suppression system.	The existing system would be removed and not replaced.	The operational system would be upgraded to gravity flow with buried pipelines.	Same as Applicant's Proposed Plan
<b>ISSUE 9 – REVEGETATION</b>				
<b>Seed Mixes</b>	Reclaimed areas that were seeded before 2000 used approved Existing Plan mixes. Areas reclaimed in 2000 used modified Applicant's Proposed Plan mixes.	Two approved grassland and Douglas fir open-forest seed mixes have been approved. Areas seeded with the Douglas fir mix could be supplemented with Douglas fir, snowberry, gooseberry, and/or woods rose nursery tubelings. Areas seeded with the grassland mix could be supplemented with willow, aspen, rabbitbrush, and big sagebrush tubelings.	Same as Existing Plan, except the two mixes have been modified based on comments received during scoping from Yellowstone National Park botanists.	Seed mixes would be modified as recommended by Producers (2000b) ( <i>Appendix B</i> ).
<b>Seeding Rate/Mixture</b>	Existing Plan mixes and rates were used prior to 1999. Applicant's Proposed Plan mixes and rates were used in 2000.	Grassland (29 lb/acre, 16 species, 31% introduced species) Douglas fir (33 lb/acre, 15 species, 33% introduced species)	Grassland (65 lb/ acre, 16 species, 14% introduced species) Douglas fir (65 lb/ acre, 15 species, 15% introduced species)	DEQ would reduce seeding rate, number of species, and limit number of introduced species per Producers' (2000b) recommendations.
<b>Revegetated Communities</b>	Grassland and Douglas fir open forest	Same as Operational Conditions	Same as Existing Plan except 14 more acres would be converted from grassland to Douglas fir	Same as Applicant's Proposed Plan.



Table 2-2. Comparison of Alternatives

FEATURES	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
			open forest	
Growth Medium	NA	TSF: 12" of soil and 3" of gravel.	TSF: 12" of soil and 36" of alluvial borrow material for subsoil.	Same as Applicant's Proposed Plan.
		Other disturbances: 8" soil or 4" soil and 4" of alluvial borrow for subsoil unless soil in fillslopes.	Same as Existing Plan.	Same as Existing Plan.
Soil Amendments	NA	No amendments have been proposed. Only surface mulches would be used. TSF cap design includes 9" of tailings mixed with bentonite and compacted below the growth medium.	Revegetated areas would be amended with composted horse manure. Compost would be incorporated 6 inches deep.	Same as Applicant's Proposed Plan except recommendations for organic amendments would be modified per Producers' (2000b) findings (i.e. manure on grasslands, wood waste on forested areas) <i>Appendix B</i> .
Seepage Quantity (see Issue 1)	2-60 gpm, averaging 3.0 gpm (includes storm water)	0.005-0.85 gpm, averaging 0.22 gpm (storm water routed off site)	0-0.78 gpm, averaging 0.14 gpm (storm water routed off site)	Same as Applicant's Proposed Plan.
Planting Shrubs/Trees	NA	TSF: none	TSF: 400 seedlings/acre on top and none on slopes.	TSF: 400 seedlings/acre on all acres.
		Other disturbances: none	Other disturbances: none	Other disturbances: Same as Applicant's Proposed Plan.
Disturbed Acres	Currently there are approximately 69 acres disturbed as part of Operating Permit 00100.	The permitted disturbance in Operating Permit 00100 is 106 acres. Only 69 acres will be disturbed.	Same as Existing Plan, plus TVX would voluntarily reclaim some historic disturbances.	Same as Applicant's Proposed Plan.
Metal Content in Vegetation	The 1986 EIS noted the metal content in vegetation on thin soils over historic tailings were within the normal range.	Same as Operational Conditions.	Same as Operational Conditions	Same as Operational Conditions
Revegetation Measurement of Effect	NA	No success criteria have been proposed in the operating permit.	Vegetative cover, production, species diversity, and density meet or exceed plan goals agreed with DEQ. Test by criteria based on reference areas or baseline studies discussed in 1986 EIS.	Modify revegetation and monitoring plan based on review agreed to with DEQ.

Table 2-2. Comparison of Alternatives

FEATURES	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
<b>Bond for Revegetation Costs</b>				
<i>Revegetation, erosion, and weed control costs</i>	\$800/acre	Recalculated bond: \$2500/acre	New bond: \$2500/acre	Same as Applicant's Proposed Plan.
<i>Organic amendments</i>	Organic amendments are not required in Existing Plan. Acres reclaimed in 2000 used some agency-approved organic amendments.	Organic amendments were not proposed in Existing Plan.	Organic amendments have been proposed and would be bonded in Applicant's Proposed Plan.	Same as Applicant's Proposed Plan except DEQ has modified the plan and bonded for manure on grassland areas and wood waste on forested areas.
<b>ISSUE 10 – NOXIOUS WEEDS</b>				
<b>Presence of Noxious Weeds</b>	Weeds controlled since 1986. Weeds are limited to isolated stands of Canada thistle and dalmatian toadflax.	Other weed species closest to the site are spotted knapweed and houndstongue.	Same as Existing Plan.	Same as Existing Plan.
<b>Noxious Weed Control Plan</b>	A mechanical and chemical control plan has been approved by Park County. The operating permit also includes requirements to control weeds operationally.	The weed control plan would remain throughout the reclamation phase, until bond is released.	Same as Existing Plan. If the USFS takes over the property, the TVX bond would be released and the USFS would be responsible for weed control.	Same as Applicant's Proposed Plan.
<b>Acres to be Revegetated (Potential Areas of Weed Invasion)</b>	16.7 acres have been revegetated through 2000.	More than 60 acres total would be revegetated by the time bond is released.	Same as Existing Plan plus some historic disturbances would be reclaimed and revegetated.	Same as Applicant's Proposed Plan.
<b>Bond (see Issue 11)</b>	No bond is in place for weed control during operations.	Bond is in place for weed control throughout the closure process.	Same as Existing Plan except if the USFS takes over the property, the TVX bond would be released and the USFS would control weeds.	Same as Applicant's Proposed Plan.
<b>Noxious Weeds Measurement of Effect</b>	Noxious weeds are inspected and controlled as needed.	Same as Operational Conditions.	Noxious species would be controlled consistent with TVX's Park County approved control plan guidelines. TVX would maintain records and test by inspection to ensure that mechanical and chemical weed control programs are being implemented. TVX would test all imported soil building	Same as Applicant's Proposed Plan plus revegetation specialist would review weed control practices.

Table 2-2. Comparison of Alternatives

FEATURES	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
			materials for germination of noxious weeds. TVX would wash all heavy and light equipment brought onsite for reclamation activities.	
<b>ISSUE 11 – BOND</b>				
<b>Operating Permit Bond Summary</b>	The existing bond includes costs for reclamation of all facilities constructed as part of Operating Permit 00100 including structures, tailings storage facility, roads, development rock piles, miscellaneous costs, and water treatment.	The recalculated bond would include revised costs for reclamation of the same facilities included in the Existing Plan plus the Crevice Adit plug.	Same as the Existing Plan bond plus: deeper soil, organic amendments and no clay cap on TSF; organic amendments on all disturbances; removal of hazardous and petroleum wastes; reclamation of more structures, openings, and development rock piles. No bond for Crevice Adit plug.	Same as Applicant's Proposed Plan.
<b>Exploration License Bond Summary</b>	Exploration site reclamation is currently bonded under the exploration license: First Chance Portal and Crevice Adit.	Recalculated bond would include exploration sites under the operating permit bond.	Same as Existing Plan.	Same as Existing Plan.
<b>Bond Indirect Costs</b>	Additional bond is held for engineering redesign, mobilization/demobilization of equipment, administration fees, and a 5-year inflation adjustment. No contingency activities have been bonded. Bond includes 21 percent indirect costs.	The recalculated bond would include the same indirect costs as the existing bond. Bond includes 42 percent indirect costs.	Same as Existing Plan plus a general 5 percent contingency bond for reclamation and 10 percent contingency for operation and maintenance in water treatment bond. The water treatment bond would include an operation and maintenance bond and would be calculated for 100 years to cover site management costs and water treatment. Bond includes 42% indirect costs.	Same as Applicant's Proposed Plan. No additional bond added for contingencies for water treatment.
<b>Bond Release</b>	NA	A bond release for work done by January 1, 2001 has been included in the bond recalculation.	Same as Existing Plan.	Same as Existing Plan.
<b>Bonded Obligation</b>	\$7,606,826+\$1,124,400 in July 2001.	\$4,206,040 for reclamation and \$4,478,000 for water treatment.	\$3,330,724 for reclamation and \$6,383,000 for water treatment.	\$3,395,000 for reclamation and \$6,419,000 for water treatment.

Table 2-2. Comparison of Alternatives

FEATURES	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
<b>Basis for Bond</b>				
<b>Reclamation Bond</b>	Bond is based on the actual costs for the State to do the job if the operator defaults.	Same as Operational Conditions.	Same as Operational Conditions.	Same as Operational Conditions.
<b>Long-term Maintenance Bond</b>	No bond is currently being held for long-term maintenance of site. Bond is held for just 3 years of water treatment.	Same as Operational Conditions except the bond has been recalculated for 5 years of water treatment.	The bond would be at a level sufficient to generate income to fund long-term maintenance of the site for 100 years or until bond release.	Same as Applicant's Proposed Plan.
<b>Reclamation of Water Treatment Facilities</b>	NA	No bond is currently held for reclamation of water treatment facilities when no longer needed.	Same as Existing Plan.	Bond has been calculated for reclamation of water treatment facilities when no longer needed.
<b>Bond Terms</b>				
<b>Reclamation Bond</b>	Held until reclamation is complete and revegetation is successful.	Same as Operational Conditions.	Same as Operational Conditions.	Same as Operational Conditions.
<b>Long-term Maintenance Bond</b>	The current bond includes only 3 years of water treatment.	The recalculated bond includes only 5 years of water treatment.	The bond would include 100 years of water treatment costs including operation and maintenance costs.	Same as Applicant's Proposed Plan.
<b>Bonding Mechanism</b>				
<b>Reclamation Bond</b>	Letter of Credit	Letter of Credit or other accepted instrument. If operator defaults, bond converts to cash.	Same as Existing Plan.	Same as Existing Plan.
<b>Long-term Maintenance Bond</b>	Letter of Credit	Letter of Credit or other accepted instrument. Recalculated bond terms: if operator defaults, water treatment bond converts to cash, which DEQ would invest as a trust fund.	Same as Existing Plan.	Same as Existing Plan.
<b>Affect on Bond if Property Transferred to the USFS</b>	NA	NA	If USFS takes over the property, the operator's bond would be released. Long-term maintenance would be assumed by USFS.	Same as Applicant's Proposed Plan.

Table 2-2. Comparison of Alternatives

FEATURES	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
<b>Contingency Bond</b>	No contingency bond is currently in place.	Same as Operational Conditions.	2 years of backup RO/evaporation for TSF seepage until biological treatment system meets design criteria.	Same as Applicant's Proposed Plan, plus TVX and DEQ has added four contingencies for 1300 Adit and TSF seepage water treatment ( <i>Appendix D</i> ).
	No treatment for monitoring well MW-10 is in current bond.	Same as Operational Conditions.	In situ treatment contingency for MW-10 water quality has been added.	Same as Applicant's Proposed Plan.
<b>MMRA Bond Reviews</b>				
<i>Annual Bond Overview</i>	Yes	Annual bond overviews would be conducted until the bond is released.	Same as Existing Plan. Overviews would stop if USFS takes over the property.	Same as Applicant's Proposed Plan.
<i>5-Year Bond Review</i>	Yes	5-year bond overviews would be conducted until the bond is released.	Same as Existing Plan. 5-year reviews would stop if USFS takes over the property.	Same as Applicant's Proposed Plan
<b>ISSUE 16 – GROUNDWATER</b>				
<b>Groundwater Quality in Alluvium</b>				
<i>Arsenic</i>	The background level of arsenic is naturally elevated (0.036 mg/L) and has been increased by historic mining. The background level exceeds the QWB-7 standard of 0.02 mg/L.	The mining-related sources of water containing elevated levels of arsenic from the operating permit would not be treated. For more information on 1300 Adit seepage, see Issue 4; for TSF seepage, see Issue 1.	The mining-related sources of water containing elevated levels of arsenic would be treated (See Issues 1 and 4).	DEQ has added four contingency treatment plans and additional monitoring sites to plan.
	Arsenic trends are increasing in some wells near the TSF and appear to be correlated to a water level rise in the area.	The monitoring of arsenic levels near the TSF has not been proposed.	Monitoring of arsenic trends near the TSF would continue.	Same as Applicant's Proposed Plan.
<i>Nitrate</i>	Operational nitrate concentrations are increasing in some wells around the TSF but are all less than 2.0 mg/L. The QWB-7 standard for nitrate is 10 mg/L.	No plan has been proposed for monitoring the nitrate concentrations near the TSF.	The proposed monitoring plan would continue to monitor the trends in nitrate near the TSF.	Same as Applicant's Proposed Plan.

Table 2-2. Comparison of Alternatives

FEATURES	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
<i>TSF Area (for more information on TSF seepage treatment, see Issue 1)</i>	The seepage from the TSF is currently treated by RO/evaporation.	There is no reclamation plan for the seepage collection pond or TSF seepage.	Treatment of TSF seepage to groundwater standards and reclamation of seepage collection pond is included in the CCP.	DEQ would require monitoring after mixing TSF seepage with Crevice Adit water at the upland HDS site and at wet meadow HDS to ensure groundwater standards are met.
<i>Monitoring well MW-10</i>	The process ponds were reclaimed in 1999 and were found to be leaking. They are a potential source of nitrate contamination in MW-10. The nitrate value still exceeds 10 mg/L and a response action plan is in place. The nitrate trend has leveled off and monitoring continues.	No plan is proposed for treating MW-10 if needed.	Same as Existing Plan. If the trend does not drop below the standard of 10 mg/L, a contingency bond would be held for in situ bioremediation.	Same as Applicant's Proposed Plan.
<b>Water Rights</b>	No impacts to existing valid water rights have been documented.	Same as Operational Conditions.	Same as Operational Conditions.	Same as Operational Conditions.
<b>Springs</b>	No springs are located in or near the MHM permit boundary	Same as Operational Conditions.	Same as Operational Conditions.	Same as Operational Conditions.
<b>Measurement of Effect</b>	No proposed measurement of effect is proposed in the operating plan. TVX has to comply with the MPDES limits at outfalls.	Same as Operational Conditions.	TVX has proposed the following criteria: ground water quality in the mine area would be the same as or better than the current background quality. TVX would monitor select existing wells around the TSF, OTS, and mine areas. TVX would extend existing trend studies for arsenic and nitrate near the TSF. TVX and USGS have conducted a one-time Bear Creek stream tracer study to identify any residual points of ground water discharge to Bear Creek carrying pollutants and ascertain their quality, quantity, and source.	Same as Applicant's Proposed Plan.



Table 2-2. Comparison of Alternatives

FEATURES	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
<b>ISSUE 18 – WILDLIFE – BATS</b>				
<b>Reclamation of historic openings</b>	NA	No reclamation of historic openings is required under the operating permit.	Company would voluntarily reclaim 12 historic mine openings considered safety hazards. Authorization under the operating permit is not required.	Same as Applicant's Proposed Plan. DEQ asked TVX to evaluate openings for potential future use by USFS and bat habitat.
<b>Potential Bat Use</b>				
<i>Historic Openings</i>	No use by bats has been documented in the area.	The historic sites are not covered by the Metal Mine Reclamation Act.	8 historic mine openings would be voluntarily supplied with a bat grate.	Same as Applicant's Proposed Plan.
<i>Current Openings</i>	No use by bats has been documented in the area.	No preservation of bat habitat during closure of permitted openings has been proposed. TVX has voluntarily placed a bat grate on the First Chance Portal.	Same as Existing Plan, except the Crevice Adit would be voluntarily grated by TVX based on site inspections and consultation with Fish Wildlife & Parks.	Same as Applicant's Proposed Plan.
<b>MPDES PERMIT LIMITS</b>				
<b>Outfall 001 for Crevice Adit Water to Bear Creek</b>				
<i>Water Quantity</i>	Permitted flow is 1,300 gpm. Actual flow has decreased to <400 gpm.	No flow after adit is plugged.	Permitted flow would be modified to 200 gpm.	Same as Applicant's Proposed Plan.
<i>Flow Monitoring</i>	Flow monitored weekly.	No flow monitoring is needed.	Flow would be monitored quarterly.	Same as Applicant's Proposed Plan.
<i>Water Quality</i>				
Non-degradation	Non-degradation criteria do not apply.	NA	Non-degradation criteria do not apply.	Same as Applicant's Proposed Plan.
Arsenic	1996 permit arsenic limit: 0.044 mg/L, 0.629 lb/day for combined discharge of Crevice Adit and 1300 Adit water. This was calculated based on 1,150 gpm and 0.07 lb/day from Crevice Adit water and 50 gpm and 0.56 lb/day from 1300 Adit water.	No quality monitoring is needed.	Revised permit arsenic limit: 0.044 mg/L, 0.1 lb/day (not combined with 1300 Adit water).	Same as Applicant's Proposed Plan.

Table 2-2. Comparison of Alternatives

FEATURES	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
Quality Monitoring	Quality monitored quarterly.	No quality monitoring is needed.	Quality monitored quarterly.	Same as Applicant's Proposed Plan.
<i>Reclamation</i>	NA	The Crevice Adit would be plugged eliminating the flow and discharge to Outfall 001.	The Crevice Adit would not be plugged. Outfall 001 would remain but would contain only Crevice Adit water.	Same as Applicant's Proposed Plan. No contingencies bonded for Outfall 001 for Crevice Adit water as it meets water quality standards. Portions of the Crevice Adit flow would be used in contingencies for TSF seepage and 1300 Adit water treatment.
<b>Outfall 002 for RO Treated TSF Seepage to Bear Creek</b>				
<i>Water Quantity</i>	Permitted flow is 50 gpm. Actual flow at TSF has decreased to 2-60 gpm or an average of less than 3.0 gpm (5 gpm has been used in the bond calculation).	Flow would be 0.005-0.85 gpm, average flow is predicted to be 0.22 gpm. MPDES permit would have to be revised if this alternative is selected.	Permitted flow is 50 gpm. Flow would decrease to 0-0.78 gpm and an average of 0.14 gpm (4 gpm used in bond calculation).	Same as Applicant's Proposed Plan.
<i>Flow Monitoring</i>	Flow is monitored daily.	The MPDES permit would have to be revised if this alternative is selected.	Same as Operational Conditions.	Same as Operational Conditions.
<i>Water Quality</i>				
Non-degradation	Non-degradation criteria do apply.	The MPDES permit would have to be revised if this alternative is selected.	Same as Operational Conditions.	Same as Operational Conditions.
Arsenic	Arsenic limit: 0.0053 mg/L, 0.0032 lb/day based on a 50 gpm flow.	The MPDES permit would have to be revised if this alternative is selected.	Arsenic limit: 0.0053mg/L, 0.032 lb/day.	Same as Applicant's Proposed Plan.
Quality Monitoring	Quality monitored weekly.	The MPDES permit would have to be revised if this alternative is selected.	Same as Operational Conditions.	Same as Operational Conditions.

Table 2-2. Comparison of Alternatives

FEATURES	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
<i>Reclamation</i>	NA	Flow from the process ponds has ceased because of reclamation of the ponds in 1999. The TSF would be reclaimed but there are no plans for TSF seepage treatment or for reclamation of the SCP. Therefore, operational conditions for Outfall 002 to Bear Creek for TSF seepage would have to be modified in the Existing Plan.	The SCP would be reclaimed. Outfall 002 would only be used until the end of 2002 or until the flow from the reclaimed TSF dropped below 1.0 gpm. Then the flow would be diverted to a zero discharge biological treatment system and HDS that would eliminate discharge and Outfall 002. Maintenance of the TSF biological treatment system would be facilitated by redundancy in design.	<p>Same as Applicant's Proposed Plan plus two contingencies (Options A &amp; B). These passive gravity-driven systems would be developed to ensure ground water standards are met at the upland HDS and surface water standards are met in Bear Creek. These options are designed to allow discharges when the biological treatment system is down for maintenance or repairs.</p> <p>Option A would use up to 184 gpm of the Crevice Adit flow to meet ground water standards before TSF seepage went into the upland HDS.</p> <p>Option B would use up to 200 gpm of the Crevice Adit flow to ensure TSF seepage met water quality standards before entering Bear Creek at a new contingency Outfall 006.</p>
<b>Outfall 003 for 1300 Adit Discharge to Outfall 001 to Bear Creek</b>				
<i>Water Quantity</i>	Permitted flow 50 gpm. Actual flow has decreased to 15 gpm.	MPDES would have to be modified if this alternative is selected.	The surface water discharge of 1300 Adit water would be converted to a ground water discharge to the existing septic system at Outfall 005, eliminating the need for Outfall 003. Permitted flow at Outfall 005 would be 15 gpm.	Same as Applicant's Proposed Plan.
<i>Flow Monitoring</i>	Flow monitored daily.	MPDES would have to be modified if this alternative is selected.	Outfall 003 has been redesignated Outfall 005 (see below).	Same as Applicant's Proposed Plan.

Table 2-2. Comparison of Alternatives

FEATURES	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
<b>Water Quality</b>				
Non-degradation	Non-degradation criteria do not apply.	MPDES would have to be modified if this alternative is selected.	Outfall 003 has been redesignated Outfall 005 (see below).	Same as Applicant's Proposed Plan.
Arsenic	The current quality of the 1300 Adit water is 0.05-0.06 mg/L arsenic. The 1996 permit allowed 0.56 lb/day based on 1.0 mg/L arsenic and a 50 gpm flow from the 1300 Adit to discharge with the Crevice Adit water at Outfall 001.	MPDES would have to be modified if this alternative is selected.	Outfall 003 has been redesignated Outfall 005 (see below).	Same as Applicant's Proposed Plan.
Quality Monitoring	Quality monitored weekly.	MPDES would have to be modified if this alternative is selected.	Outfall 003 has been redesignated Outfall 005 (see below).	Same as Applicant's Proposed Plan.
<b>Reclamation</b>	No reclamation is proposed for the historic 1300 Adit.	Same as Operational Conditions. Plugging the Crevice Adit would remove the diluting water for the 1300 Adit discharge. There is no plan for treating the 1300 Adit discharge. MPDES would have to be modified if this alternative is selected.	Reclamation is proposed for the historic 1300 Adit as shown in Figure 2-7. The septic system would have to be maintained to discharge the treated 1300 Adit flow (see Outfall 005).	Same as Applicant's Proposed Plan.
<b>Outfall 005 for 1300 Adit discharge to Septic Tank</b>				
<b>Water Quantity</b>	NA	NA	Permitted flow would be 15 gpm.	Same as Applicant's Proposed Plan.
<b>Flow Monitoring</b>	NA	NA	Flow would be monitored monthly.	Same as Applicant's Proposed Plan.
<b>Water Quality</b>				
Non-degradation	NA	NA	Non-degradation criteria do not apply.	Same as Applicant's Proposed Plan.
Arsenic	NA	NA	Arsenic limit: 0.036 mg/L. 0.009 pounds/day.	Same as Applicant's Proposed Plan.
Quality Monitoring	NA	NA	Quality monitored monthly.	Same as Applicant's Proposed Plan.

Table 2-2. Comparison of Alternatives

FEATURES	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
<i>Reclamation</i>	NA	NA	Reclamation is proposed for the historic 1300 Adit as shown in Figure 2-7. The septic system would have to be maintained to discharge the treated 1300 Adit flow.	<p>Same as Applicant's Proposed Plan plus two contingencies (Options C &amp; D). DEQ would bond for two passive gravity-driven contingencies to ensure ground water standards are met at Outfall 005 and surface water standards are met at Outfall 001. These options are designed to allow discharges when the chemical addition building coprecipitation process system is down for maintenance or repairs.</p> <p>Option C would use up to 190 gpm of the Crevice Adit flow to ensure the 1300 Adit discharge meets ground water standards before it enters the septic tank drainfield at Outfall 005.</p> <p>Option D would use a buried pipeline to route the 1300 Adit discharge for mixing with Crevice Adit water to Bear Creek at Outfall 001.</p>
Contingency Outfall 006 for TSF Seepage and Crevice Adit Water to Bear Creek	NA	NA	NA	This outfall would be permitted only if the need arises.





Table 2-3. Comparison of Impacts among Alternatives

IMPACTS	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
<b>ISSUE 1 – TAILINGS STORAGE FACILITY (TSF) – BIOLOGICAL TREATMENT SYSTEM, CAP DESIGN AND STABILITY</b>				
<b>TSF Seepage Treatment System</b>	Reverse osmosis (RO) is a proven system for achieving water quality standards. The existing RO system is expensive to operate and maintain in the long term.	No plan for long-term treatment is proposed.	The biological treatment system is not proven. RO would be used until the biological treatment system meets design criteria. The biological treatment system requires funds to operate and maintain.	Same as Applicant's Proposed Plan plus two contingency options. Options are gravity-driven, low-maintenance systems.
<b>Maintenance Requirements</b>	Maintain and operate surface pipelines, seepage collection pond (SCP), RO/evaporation system, high volume and head pump to treatment plant.	Reduced seepage flows after reclamation. No plan proposed for long-term water treatment.	Maintain operational RO/evaporation system until TSF seepage drops to 1.0 gpm. The biological treatment system requires less maintenance than Existing Plan because of reduced seepage and gravity-driven systems. A smaller pump from the wet meadow to upland HDS would be needed than in operational system.	Same as Applicant Proposed Plan except minimal operational and maintenance costs for contingency pipelines.
<b>Cap Design</b>				
<b>Type of Design</b>	NA	The water barrier cap is a proven design if the barrier layer is not compromised. Barrier layer would be compromised.	The water balance cap is a proven system if it is thick enough to hold water in storage. The water balance cap not thick enough to hold all seepage.	Same as Applicant's Proposed Plan
<b>Long-term Operability</b>	NA	The clay barrier layer would degrade because of frost action, desiccation, and some root penetration. No tree windfall impacts.	No long-term degradation of cap function from frost action, desiccation, and root penetration. More potential tree windfall impacts.	Same as Applicant's Proposed Plan
<b>Maintenance Requirements</b>	NA	More maintenance would be needed to prevent degradation of clay cap and degradation is unavoidable due to frost action and wetting and drying of cap.	No maintenance would be required to maintain cap function. Frost action and wetting and drying would not affect cap function.	Same as Applicant's Proposed Plan

Table 2-3. Comparison of Impacts among Alternatives

IMPACTS	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
<i>Tree Removal</i>	NA	Woody vegetation would have to be removed to limit rooting impacts to the water barrier layer.	No removal of trees would be needed. Tree windfall impacts would be limited because of cap thickness.	Same as Applicant's Proposed Plan
<i>Erosion potential</i>	High wind and water erosion potential exists.	A short-term erosion potential exists until vegetation would establish.	Same as Existing Plan.	More short-term erosion potential exists because of reduced seeding rates.
<b>Water Quality</b>	TSF seepage does not meet water quality standards for cyanide, arsenic, sulfate, manganese, nickel, zinc and iron without RO treatment.	Reclamation would reduce seepage. No plan is proposed for long-term water treatment.	Reclamation would reduce seepage more than Existing Plan. RO would ensure water quality standards are met until biological treatment system has reduced seepage to 1.0 gpm. A zero discharge biological treatment facility would meet ground water quality standards in HDS systems.	Same as Applicant's Proposed Plan. Two contingencies added to ensure water quality standards are met in wet years and in event biological treatment system is down for repairs or maintenance.
<b>Water Quantity</b>	Actual flow: 2-60 gpm  average 3.0 gpm (included stormwater until fall 2000.)	Predicted flow:  Up to 95 percent less than operational levels.  average 93 percent less flow than operational levels (stormwater routed off site)	Predicted flow:  94-100 percent less than Existing Plan flows.  average 36 percent less than the Existing Plan flows (stormwater routed off site)	Same as Applicant's Proposed Plan
<b>Erosion</b>	Minimal erosion has occurred operationally due to tailings compaction and shallow slopes.	The short-term erosion potential would be less than the operational potential because of rock content in reclamation soil. The vegetation community dominated by grasses would control long-term erosion to acceptable levels due to the shallow slopes and heavy seeding rate.	The short-term erosion potential would be less than the Existing Plan because the heavier seeding rate would increase density of younger plants reducing erosion. Long-term erosion potential same as Existing Plan due to vegetation community dominated by grasses. Trees would not survive.	The short-term erosion potential would be higher than Applicant's Proposed Plan because the seeding rate would be reduced due to recommendations of Producers (2000b) (Appendix B). The long-term potential would be minimal because of shallow slopes and dominance by a Douglas fir community.
<b>MPDES Permit Limitations</b>	Flow and quality limits were set by the MPDES permit for Outfall 002 to discharge treated TSF seepage	The process ponds were reclaimed in 1999 reducing the amount of treated water containing metals reporting to	The revised MPDES permit limit for arsenic at Outfall 002 would be the same as Existing Plan.	Same as Applicant's Proposed Plan. Two contingencies were added to ensure a water

Table 2-3. Comparison of Impacts among Alternatives

IMPACTS	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
	and process pond water.	Bear Creek. No plan for TSF seepage exists in the Existing Plan after reclamation. The MPDES permit would have to be revised if this alternative is selected. TSF seepage flow would reduce to 0.85 gpm maximum and 0.22 gpm average so less arsenic would report to Outfall 002 and Bear Creek if RO was continued in a revised MPDES permit.	TSF seepage would report to Outfall 002 until 2002. After TSF seepage dropped to less than 1.0 gpm the biological treatment system would treat the water and there would be no discharge to ground water. This would be a 100% reduction of existing arsenic load to Bear Creek in Outfall 002.	treatment plan would be in place during maintenance and repairs of the biological treatment system. Contingency Option B would require a new Outfall 006 if ever used and would add some arsenic to Bear Creek.
TSF Stability	NA	Periodic saturation above the compacted clay layer would increase the probability of shallow slope failures.	No stability problem would exist because there would be less chance for saturation at the subsoil contact with tailings.	Same as Applicant's Proposed Plan.
Bond (see Issue 11)	Existing bond is adequate for reclamation. Water treatment bond is limited to 3 years.	Recalculated bond would be adequate for reclamation. Water treatment bond would be limited to 5 years.	Bond would be adequate for reclamation. Water treatment bond would be for 100 years.	Same as Applicant's Proposed Plan.
<b>ISSUE 3 – CREVICE ADIT WATER SYSTEM DESIGN</b>				
Water Quality	Flow meets all water quality standards with no water treatment. No impacts.	No impacts.	No impacts.	No impacts. No contingency needed
Water Quantity/Flow	<400 gpm flow added to Bear Creek.	Flow would be limited to some seepage around adit plug. Approximately 100 percent reduction in flow to Bear Creek.	Flow would be reduced to 50 percent of operational flow to Bear Creek.	Same as Applicant's Proposed Plan.
Dewatering Crevice Mountain or Impacts to Palmer Creek Flows	Crevice Mountain continues to dewater as water table drops. No impacts to Palmer Creek flow have been documented.	The Crevice Mountain water table would reestablish over time. Any past impacts, if any, to Palmer Creek would be mitigated.	Crevice Adit drill holes would be grouted to reduce drawdown of the water table. Ultimate impacts to Crevice Mountain water table would be less than Operational Conditions. Potential Palmer Creek flow impacts would be less than under Operational Conditions.	Same as Applicant's Proposed Plan.
Jardine Water System	<50 gpm. High maintenance system in place with surface	0 gpm. Jardine would have to find a replacement system.	Same as operational flow. System would be a low-maintenance buried gravity-flow	Same as Applicant's Proposed Plan

Table 2-3. Comparison of Impacts among Alternatives

IMPACTS	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
	pipeline.		pipeline.	
<b>MPDES Permit</b>	MPDES Outfall 001 to Bear Creek for 1,300 gpm for Crevice Adit and 1300 Adit discharges. Current flow is about 400 gpm (<400 gpm from Crevice Adit and 15 gpm from 1300 Adit).	The adit would be plugged, eliminating Crevice Adit flow to Outfall 001. The MPDES would have to be modified if this alternative is selected to deal with 1300 Adit seepage.	The MPDES permitted flow would be reduced by 85 percent to 200 gpm. Current flows to Bear Creek would be reduced by about 50 percent.	Same as Applicant's Proposed Plan. Contingency plans for 1300 Adit and TSF seepage would use Crevice Adit water when water treatment systems are down for repairs or maintenance.
<b>Water System Maintenance</b>	High maintenance is needed because both pipelines to Bear Creek and to the Jardine fire system are surface HDPE lines. Pumping is needed to the Jardine water system.	No maintenance of water lines would be needed as adit would be plugged and water lines would be removed.	Buried high quality HDPE pipelines and gravity-driven systems would reduce the maintenance needed over current operational systems.	Same as Applicant's Proposed Plan. No contingency pipelines would be needed.
<b>Potential Bat Habitat</b>	Potential use exists, but it is limited because of operation and maintenance of water system	No habitat would be available after adit would be plugged and workings are flooded.	Potential use by bats in future would be preserved by installation of a bat grate.	Same as Applicant's Proposed Plan
<b>Affects on Future Use by Forest Service</b>	NA	The local fire district would have to reactivate the Pine Creek system or construct another water supply system.	There would be less maintenance because of high quality, buried, HDPE pipelines and no pumps would be needed. The operation of water systems would be significantly reduced over current Operational Conditions.	Same as Applicant's Proposed Plan. No contingency pipelines would be needed.
<b>Monitoring</b>				
<i>Flow</i>	Routine inspections for leaks are needed by walking the surface pipelines. Flow is monitored per MPDES permit.	Less monitoring would be needed after adit is plugged.	Less monitoring would be required per modified MPDES permit because Crevice Adit flow would be reduced and 1300 Adit water would be removed from Outfall 001.	Same as Applicant's Proposed Plan
<i>Quality</i>	Monitoring continues per MPDES, operating permit, stormwater and Public Water Supply permits	Less monitoring would be needed as adit is plugged. The Jardine fire district would have to develop a new water system.	Less monitoring would be required per MPDES permit because quality of water at Outfall 001 would be improved after 1300 Adit water is removed	Same as Applicant's Proposed Plan. Contingencies have been added to treatment systems for 1300 Adit and TSF seepage discharges, which may use

Table 2-3. Comparison of Impacts among Alternatives

IMPACTS	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
			from the outfall.	Crevice Adit water occasionally.
<b>Bond (see Issue 11)</b>	Existing bond is adequate for reclamation work. Bond is inadequate for plugging adit properly. Bond is inadequate to maintain water system more than 5 years.	Recalculated bond would be adequate for reclamation work and for plugging adit properly. Bond covers water system operation and maintenance for 5 years.	Bond would be adequate for reclamation work and covers water system operation and maintenance for 100 years.	Same as Applicant's Proposed Plan. No bond for contingency plans would be needed.
<b>MPDES permit Limits</b>	Arsenic limits are set by the MPDES permit for Outfall 001 discharge to Bear Creek. The permitted Crevice Adit addition of arsenic is minimal (0.07 lb/day). The actual contribution of arsenic to Bear Creek at current flows is 0.02 lb/day.	No MPDES permit would be needed if this alternative is selected. 100 percent reduction of the minimal Crevice Adit arsenic addition to Bear Creek would result.	Outfall 001 limits would be revised. Even though the permitted limit of arsenic that could be added to Bear Creek would increase to 0.1 lb/day, the actual contribution would be a 50% reduction over operational levels.	Same as Applicant's Proposed Plan.
<b>ISSUE 4 – 1300 ADIT DRAINAGE</b>				
<b>Water Quality</b>	All arsenic reports to Bear Creek.	No system is proposed for treatment of 1300 Adit discharge.	No arsenic would report to surface water. Arsenic would be reduced in Outfall 005 before it would be discharged to ground water.	Same as Applicant's Proposed Plan.
<b>Water Quantity/Flow</b>	15 gpm to Bear Creek.	No system is proposed for disposal of 1300 Adit discharge.	15 gpm would report to ground water. Fewer impacts to Bear Creek would result.	Same as Applicant's Proposed Plan.
<b>MPDES / UIC Permits</b>	0.009 lb/day of arsenic reports to Bear Creek.	No treatment system has been proposed. If this alternative is selected the MPDES permit would have to be revised.	The Applicant's Proposed Plan would result in a 100 percent reduction of arsenic load to Bear Creek over Operational Conditions. 0.009 lb/day would be the maximum arsenic load that would be allowed to ground water.	Same as Applicant's Proposed Plan plus two contingencies added for Crevice Adit water additions to 1300 Adit flows. These options would ensure treatment of the 1300 Adit flow while the coprecipitation system was being maintained or repaired.
<b>Water System Maintenance</b>	Surface, gravity-fed HDPE pipeline requires visual inspections regularly and is susceptible to	No treatment system has been proposed.	Proposed buried gravity-fed, HDPE pipeline would require less maintenance than	Same as Applicant's Proposed Plan plus the operation and maintenance of two

Table 2-3. Comparison of Impacts among Alternatives

IMPACTS	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
	damage from vandalism etc.		operational system. The chemical addition system would require regular restocking of ferric sulfate. No additional pumping of the septic system would be needed as the amount of sludge produced would be minimal.	contingency gravity-fed pipelines and valves.
<b>Monitoring</b>				
<i>Flow</i>	Routine inspections of surface pipeline are needed. Flow is monitored per the MPDES permit at Outfalls 003 and 001.	Monitoring is unknown because no treatment system has been proposed.	Fewer visual inspections would be needed because of buried pipelines. Less monitoring per revised MPDES and/or UIC permits ( <i>Appendix C</i> ) would be needed because of ground water outfall rather than surface water outfall.	Same as Applicant's Proposed Plan plus some additional monitoring of contingency pipelines if ever used.
<i>Quality</i>	Monitoring is required per MPDES permit Outfalls 003 and 001.	No treatment system has been proposed.	Less monitoring per revised MPDES and/or UIC permits ( <i>See Appendix C</i> ) would be required because of ground water outfall rather than surface water outfall.	Same as Applicant's Proposed Plan plus an additional monitoring site would be needed after coprecipitation and settling in septic tank.
Affects on Future Use by USFS	NA	NA	USFS would have to operate and maintain ferric sulfate coprecipitation system and Outfall 005. The buried gravity-flow pipelines would require little maintenance.	Same as Applicant's Proposed Plan plus the USFS would have two contingency system pipelines in place if needed when chemical addition system is down for repairs or maintenance.
Potential Bat Habitat (see Issue 18)	None. Adit is collapsed. There is no entry.	Same as Operational Conditions.	Same as Operational Conditions.	Same as Operational Conditions.
Bond (see Issue 11)	Bond is inadequate for 1300 Adit discharge treatment.	No bond has been calculated for an unknown treatment system.	Bond would be adequate for 100 years of water treatment.	Same as Applicant's Proposed Plan.



Table 2-3. Comparison of Impacts among Alternatives

IMPACTS	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
<b>ISSUE 5 – LONG-TERM MONITORING AND MAINTENANCE</b>				
<b>Monitoring</b>				
<i>Hydrologic (surface water, ground water, process water, stormwater)</i>	Approved plans are in place for detection of impacts under MPDES, operating permit, Public Water Supply Permit, and SWPPP.	Monitoring is inadequate under operating permit for post-closure conditions.	Monitoring would be adequate for all permits.	Same as Applicant's Proposed Plan.
<i>Revegetation</i>	Minimal monitoring has occurred during operations.	A limited monitoring program is proposed.	TVX has proposed a more aggressive program to measure reclamation success using canopy cover and biomass production goals.	Monitoring would be adequate.
<i>Noxious Weeds</i>	Monitoring and control has been successful in limiting weed populations during operations to isolated stands.	Reclamation of disturbed areas should reduce potential weed invasion but no additional monitoring is proposed especially on new seedlings.	TVX has proposed additional monitoring because of importation of soil and organic amendments, which could increase the risk of noxious weed introduction on the site.	Same as Applicant's Proposed Plan. Revised revegetation monitoring plan would include noxious weed monitoring.
<i>Erosion (See also Issue 1)</i>	BMPs have kept erosion to acceptable levels during operations.	Reclamation could increase erosion in the short term but heavy seeding rates would limit the potential problems.	Same as Existing Plan. Increased seeding rates would produce even less erosion potential. Bond would include erosion control repair costs until bond would be released.	Reduced seeding rates recommended by Producers (2000b) would increase short-term erosion rates ( <i>Appendix B</i> ).
<b>Maintenance</b>				
<i>Crevice Adit and Water Management System</i>	More maintenance is needed because of surface pipelines and reliance on pumps.	Adit would be plugged. Minimal maintenance would be needed.	Less maintenance would be required than in Operational Conditions because pipelines would be buried and gravity-driven.	Same as Applicant's Proposed Plan.
<i>1300 Adit Water Treatment System</i>	More maintenance is needed because of surface pipeline.	Unknown maintenance requirements because no system is proposed to treat 1300 Adit water after the Crevice Adit is plugged.	Less maintenance would be required because of a buried high quality HDPE, gravity-flow pipeline. More maintenance would be required because of active coprecipitation treatment system.	Same as Applicant's Proposed Plan.

Table 2-3. Comparison of Impacts among Alternatives

IMPACTS	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
<b><i>TSF RO Treatment System</i></b>	The current RO/evaporation system is expensive to run and maintain. The TSF seepage must be pumped to the treatment plant.	Same as Operational Conditions.	Same as Operational Conditions, but the RO/evaporation system would be used for only 2 years until the biological treatment system meets design criteria.	Same as Applicant's Proposed Plan.
<b><i>TSF Biological Treatment System</i></b>	NA	NA	The biological treatment system would be gravity-driven but requires maintenance to restock reagents, etc.	Same as Applicant's Proposed Plan. Two low-maintenance contingencies are proposed if biological treatment system is down for repairs or maintenance.
<b><i>Jardine Public Water Supply System</i></b>	A high maintenance surface pipeline and pump system currently in place.	Plugging the Crevice Adit would force Jardine to find an alternative system.	Less maintenance would be required than the current system because the new system would be gravity-driven, buried high quality HDPE pipeline.	Same as Applicant's Proposed Plan.
<b><i>Revegetation and Erosion</i></b>	BMPs have controlled erosion to acceptable levels during operations.	Replanted sites would have to be maintained to control erosion until vegetation community establishes. Fence may be needed to prevent overgrazing.	Same as Existing Plan. Fence would be even more critical because of wildlife impacts to young woody plants.	Same as Applicant's Proposed Plan.
<b><i>Bond (see Issue 11)</i></b>	Bond is adequate for reclamation dirtwork. Not enough bond is in place for operation and maintenance of water treatment systems.	Bond would be adequate for reclamation dirtwork. Five years of operation and maintenance has been added to water treatment bond	Bond would be adequate for reclamation and operation and maintenance of water treatment systems for 100 years.	Same as Applicant's Proposed Plan plus additional plans in place for contingencies in case water treatment systems are down for repairs or replacement.
<b>ISSUE 7 – FUTURE LAND USE</b>				
<b>Health and Safety Issues for Use</b>	Some existing health and safety risks have been reclaimed as listed in Table 2-2.	More health and safety risks would be reclaimed on site in the Existing Plan. Plans for TSF seepage treatment, reclamation of the exposed contaminated SCP, and the 1300 Adit discharge would be needed.	More historic potentially hazardous openings would be closed. All sources of operating permit contamination would be reclaimed and treated.	Same as Applicant's Proposed Plan.
<b>Liability</b>	TVX is liable for operation, closure, and future maintenance	Same as Operational Conditions.	Same as Existing Plan, in that TVX is liable for implementing	Same as Applicant's Proposed Plan.

Table 2-3. Comparison of Impacts among Alternatives

IMPACTS	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
	and operation of water treatment facilities.		the full closure plan. If the USFS takes over the property, the Federal Government would be liable for continued operation and maintenance of the site including water treatment facilities.	
<b>Land Use Potential</b>				
<i>Future</i>	NA	Future land uses would not be constrained by the operating permit after the bond is released.	Same as Existing Plan. If the USFS takes over the property, land uses would be more controlled.	Same as Applicant's Proposed Plan.
<i>Jardine Historic District</i>	New structures detract from the historic district. The historic Red Mill has been impacted by the mining operations and snow loads.	New structures would be removed. No additional impact to the historic district would occur.	Same as Existing Plan. Some restoration may occur if the USFS takes over the property.	Same as Applicant's Proposed Plan.
<i>Jardine Public Water Supply System</i>	TVX maintains the current high maintenance system.	Jardine would have to develop a new system.	Jardine would end up with a new gravity-driven system requiring less maintenance.	Same as Applicant's Proposed Plan.
<i>Impacts to Greater Yellowstone Ecosystem</i>	Wildlife use has been limited by mine operations. Wildlife that use the area have been exposed to water and metal-containing mine wastes.	Wildlife habitat and migration potential would be improved. Potential metal impacts to water and vegetation would be reduced by reclamation of disturbances. Plans would still be needed for treating TSF seepage and 1300 Adit water.	Complete plan for reclamation and water treatment of all facilities would further reduce the potential amount of metals in water and vegetation. Future USFS use would protect winter range and elk migration.	Same as Existing Plan.
<b>ISSUE 9 – REVEGETATION</b>				
<b>Revegetated Communities</b>	The heavy seeding rate and competition from grasses has limited the potential for woody plant invasion and survival on the few revegetated acres to date.	Same as Operational Conditions. The TSF would have limited need for woody plant removal to protect the bentonite-amended barrier layer.	The proposed double seeding rate would limit the potential for woody plant invasion and survival. This is especially bad for the TSF, which is dependent on the dominance by Douglas fir and other woody plants to limit seepage to predicted levels.	Seeding rates and mixes would be modified to ensure the invasion and survival of woody plants on the TSF.

Table 2-3. Comparison of Impacts among Alternatives

IMPACTS	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
<b>Biomass</b>	NA	TSF: Biomass production from grass-dominated communities would be limited because of the relatively shallow growth medium of 15". Trees would not invade because of the heavy seeding rate.	TSF: More expected biomass production from grass-dominated communities because of deeper and organically amended 48-inch cap. Trees would not survive.	TSF: Biomass production would be the highest of any plan because Douglas fir survival would be ensured and woody plants use more water than grasses (Table 3-2).
		Other disturbances: The same predicted impact would be expected because the growth medium is only 8 inches thick.	Other disturbances: Same as Existing Plan.	Other disturbances: Same as Existing Plan.
<b>TSF Seepage Quantity – (for more information see Issue 1)</b>	2-60 gpm, average 3.0 gpm (includes stormwater).	The predicted flow would be up to 96 percent less than operational levels. The average flow would be 93 percent less than operational levels. Stormwater would be routed off site.	The predicted flow would be 93-100 percent less than the Existing Plan flows. The average flow would be 36 percent less than the Existing Plan flows. Stormwater would be routed off site.	Same as Applicant's Proposed Plan.
<b>Function of Vegetation in Cap Performance and Reducing Seepage from TSF</b>	NA	The grassland vegetation's potential to reduce seepage would be restricted because of the limited root depth imposed by the clay barrier at 15 inches. Evapotranspiration would also be limited by the shallow rooting depth.	Deep rooted, woody plant vegetation would be essential to seepage reduction. But woody plants would probably not survive because of the competition from grasses. Evapotranspiration would be increased due to the 48-inch rooting depth.	The woody plants' function of reducing seepage would be ensured by revegetation plan changes.
<b>Seeding Rate/Mixture</b>	NA	State of the art seed mixtures have been approved. Seeding rates are too heavy to ensure survival of anything but grasses.	Same as Existing Plan. The proposed seed mixes have the same effect as in the Existing Plan since the rate is doubled	DEQ would reduce the pounds/acre, number of species, and limit the number of introduced species to guarantee survival of Douglas fir and other woody plants.
<b>Planting Shrubs/Trees</b>	NA	TSF: No woody plants are proposed to be planted for fear of impacts to the integrity of the clay water barrier cap. Trees that would volunteer would be removed.	TSF: Trees and shrubs would be planted to reduce seepage rates but the heavy seeding rate would limit woody plant survival.	TSF: DEQ would modify the revegetation plan to ensure survival of the woody plant community.

Table 2-3. Comparison of Impacts among Alternatives

IMPACTS	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
		Other disturbances: No impact to the revegetation plant community if trees would volunteer. Woody plants would not invade or survive because of the heavy seeding rates.	Other disturbances: No trees would be planted and heavy seeding rate would guarantee woody plants would not invade and survive.	Other disturbances: Same as Applicant's Proposed Plan
Canopy Cover	NA	The EDYS model predicts that 80 percent canopy cover would be achieved. Grasses would predominate.	Same as Applicant's Proposed Plan. Grasses would predominate, even though the EDYS model says that Douglas fir would dominate. The heavy seeding rate would limit woody plant invasion and survival.	DEQ assumes that the same canopy cover percentage would be achieved but it would take longer because the seeding rate would be reduced to guarantee tree and shrub survival.
Metal Content in Vegetation	Exposure of plants and animals to metal-laden tailings has been historically high. The OTN tailings were reclaimed in 1995. The OTS tailings were reclaimed in 2000.	Reclamation of the TSF would reduce the potential exposure of metals to plants and animals. Roots would still contact tailings at the soil/tailings interface.	Same as Existing Plan except the amount of roots present at the soil/tailings interface would be significantly reduced because of the thicker growth medium.	Same as Applicant's Proposed Plan.
Root and Tree Windfall Effects on TSF Cap Performance	NA	Frost action and wetting and drying would impair the clay cap water barrier function. Tree windfall impacts would be limited because trees would be removed from the TSF if they volunteered.	The 48-inch cap would produce greater root penetration by trees and shrubs. This would enhance cap performance by reducing seepage. Potential tree windfall effects would be greater, but the divots would be more self healing and have less impact than in the Existing Plan on cap performance.	Same as Applicant's Proposed Plan.
<b>ISSUE 10 – NOXIOUS WEEDS</b>				
Short-term potential for noxious weed invasion from revegetation plan	A high potential for noxious weed invasion exists due to the small number of reclaimed acres during operations.	Less potential for noxious weed invasion after reclamation because all disturbances would be revegetated with heavy seeding rates.	Same as the Existing Plan but TVX would use even heavier seeding rates.	More short-term potential for noxious weeds than in the Existing Plan because of reduced seeding rate and modified mixes used to promote natural invasion of native plants, and to promote establishment and survival of planted Douglas fir and other

Table 2-3. Comparison of Impacts among Alternatives

IMPACTS	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
				woody plants.
<b>Acres of revegetation</b>	The 16.7 acres reclaimed through 2000 have had little impact to date on reducing potential weed invasion and establishment on the site.	The invasion potential of noxious weeds would be reduced when the more than 60 disturbed acres would finally be revegetated.	Same as Existing Plan, plus some additional historic disturbance acreage would be reclaimed.	Same as Applicant's Proposed Plan.
<b>Potential invasion from soil and organic amendments proposed to be used for reclamation</b>	Some potential risk exists from the importation of soil and organic amendments for on-site composting and testing during operations.	More potential risk of invasion exists from imported soil and organic amendments used on acres reclaimed in 2000. Organic amendments and imported soil are not proposed in the Existing Plan.	Same as Existing Plan plus more acres would be reclaimed with imported soil and organic amendments.	Same as Applicant's Proposed Plan.
<b>Potential for future invasion from off-site.</b>	NA	A high potential exists as noxious weed populations increase in the surrounding area.	Same as Existing Plan. Future use by USFS as an interpretive site may increase the risk from additional vehicles accessing the site and carrying weed seed.	Same as Applicant's Proposed Plan.
<b>Long-term potential of Weeds to Spread onsite</b>	NA	The long-term exposure would be high due to the limited soil depth (8-15") to be used. Less vegetative growth from these shallow soils could favor weed establishment.	The long-term exposure would be the same as the Existing Plan on all disturbances except the TSF, which would get more growth medium (48 inches).	The potential long-term exposure is the same as the Existing Plan, except on the TSF as a plant community dominated by Douglas fir and other woody plants would reduce noxious weed growth.
<b>Effectiveness of weed control program</b>	There are fewer weeds on the site today than on surrounding areas.	The same effect as Operational Conditions would be possible if the weed control plan continues to be implemented.	Same as Existing Plan.	Same as Existing Plan.
<b>Bond (see Issue 11)</b>	No bond is in place for weed control during operations.	The reclamation bond for weed control continues until closure plan is successfully completed and bond is released.	Same as Existing Plan except if the USFS takes over the property, TVX's bond would be released and the USFS would have to control weeds.	Same as Applicant's Proposed Plan.



Table 2-3. Comparison of Impacts among Alternatives

IMPACTS	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
<b>ISSUE 11 – BOND</b>				
<b>Bonded Obligation</b>	The current bond is adequate for completing reclamation dirtwork. It is inadequate for water treatment.	The recalculated bond would be adequate for reclamation dirtwork. It would be inadequate for long-term water treatment.	The bond would be adequate for reclamation dirtwork and covers 100 years of water treatment system costs.	Same as Applicant's Proposed Plan.
<b>Ability of State to Collect Bond</b>				
<b>Reclamation Bond</b>	The Letter of Credit is a very liquid bonding instrument.	Same as Existing Plan.	Same as Existing Plan.	Same as Existing Plan.
<b>Long-term Maintenance</b>	Same as Reclamation Bond.	Same as Reclamation Bond.	Same as Reclamation Bond.	Same as Reclamation Bond.
<b>Affect on Bond if Property Transferred to USFS</b>	NA	NA	TVX would be responsible for completing all reclamation dirtwork and construction of all water treatment facilities. If the USFS takes over the property, taxpayer dollars would maintain the site.	Same as Applicant's Proposed Plan.
<b>Contingency Bond</b>	Contingency bonds are not included in the existing bond.	Contingency bonds are not included in recalculated bond.	Contingency bonds have been developed for TSF seepage and MW-10 nitrate bioremediation. No other contingency bond has been developed for alternate passive, gravity-driven, low-maintenance water treatment systems for 1300 Adit and TSF seepage.	Same as Applicant's Proposed Plan. DEQ and TVX have identified two passive, gravity-driven, low-maintenance water treatment systems for 1300 Adit water and TSF seepage.
<b>Bond for Revegetation Costs</b>				
<b>Revegetation, erosion, and weed control costs</b>	The bond is inadequate for revegetation, erosion repair and weed control in the existing bond.	The bond would be adequate for revegetation, erosion repair and weed control in the recalculated bond.	Same as Existing Plan.	Same as Existing Plan.
<b>Organic amendments</b>	The existing bond does not cover organic amendments.	Same as Operational Conditions.	The bond would be adequate for incorporation of organic amendments into soils.	Same as Applicant's Proposed Plan.

Table 2-3. Comparison of Impacts among Alternatives

IMPACTS	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
<b>ISSUE 16 – GROUND WATER</b>				
<b>Current Ground Water Quality in Alluvium</b>				
<i><b>Arsenic</b></i>	The background arsenic level exceeds standards as described in Table 2-2.	Background arsenic levels would increase because the Crevice Adit would be plugged and no plan exists for treating the 1300 Adit discharge and TSF seepage under Operating Permit 00100.	Background levels of arsenic could increase if water treatment methods for ground water disposal of 1300 Adit water and TSF seepage do not meet standards.	Background levels of arsenic would not increase because of contingency plans developed and additional monitoring that would be required.
	Arsenic trends are increasing in some wells around the TSF and appear to be correlated to water level rise.	Arsenic trends could increase near the TSF because no long-term monitoring plan has been proposed.	Arsenic trends would be tracked by proposed long-term monitoring plans.	Same as Applicant's Proposed Plan.
<i><b>Nitrate</b></i>	Nitrate levels are increasing as described in Table 2-2.	Nitrate levels could change because no long-term monitoring is proposed.	Nitrate levels would be monitored long-term to document the problem.	Same as Applicant's Proposed Plan.
<i><b>TSF Area</b> (for more information on TSF seepage treatment, see Issue 1)</i>	The TSF seepage is currently treated in the RO/evaporation plant.	Nitrate levels could increase because there is no reclamation plan for the SCP or treatment proposed for TSF seepage.	Reclamation of the SCP and treatment of the TSF seepage in the wet meadow HDS would prevent any increases in nitrates near the TSF.	Contingency plans and additional monitoring would ensure ground water standards for nitrates are met.
<i><b>Monitoring well MW-10</b></i>	Nitrate levels in MW-10 exceed standards as described in Table 2-2.	The reclamation of the process ponds eliminated the likely source of the nitrate contamination. No plan exists for remediation if nitrates do not drop.	The nitrate problem would be monitored and remediated if necessary. Bond has been calculated for the remediation.	Same as Applicant's Proposed Plan.
<b>Water Rights</b>	No impacts to existing valid water rights have been documented.	No impacts are expected after reclamation.	Same as Existing Plan.	Same as Existing Plan.
<b>Springs</b>	No impacts to springs in or near the MHM permit boundary have been documented.	No impacts are expected as a result of reclamation.	Same as Existing Plan.	Same as Existing Plan.
<b>ISSUE 18 – WILDLIFE - BATS</b>				
<b>Potential Bat Use</b>				
<i><b>Historic Openings</b></i>	Future use by bats is possible.	Same as Operational Conditions.	Reclamation would limit potential bat use. TVX voluntarily has agreed to place	Same as Applicant's Proposed Plan.

Table 2-3. Comparison of Impacts among Alternatives

IMPACTS	OPERATIONAL CONDITIONS	EXISTING PLAN	APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
			some bat grates on eight openings with the most potential bat use.	
<i>Current Openings</i>	Bat use was limited during operations by mining activity.	Bat use would be eliminated by closure of openings in Existing Plan except for the First Chance Portal.	Future bat use would also be preserved in the Crevice Adit.	Same as Applicant's Proposed Plan except bat grates would be inspected annually.



Table 3-1. Seepage Collection Pond Inflow Chemistry (dissolved metals)

PARAMETER	HIGH CONCENTRATION (mg/l)	AVERAGE CONCENTRATION (mg/l)	LOW CONCENTRATION (mg/l)	MONTANAA GROUNDWATER STANDARD (mg/l)
Calcium	892.0	690.0	52.0	NA
Chloride	1760.0	222.0	19.0	230.0
Potassium	157.0	122.0	24.0	NA
Magnesium	197.0	108.0	39.0	NA
Sodium	2090.0	1673.0	353.0	NA
Sulfate	5500.0	2872.0	1190.0	250.0*
Carbonate as CO <sub>3</sub>	0	0	0	NA
Bicarbonate as HCO <sub>3</sub>	205.0	55.0	<1	NA
Hardness as CaCO <sub>3</sub>	2870.0	2259.0	1480.0	NA
Acidity as CaCO <sub>3</sub>	3200.0	340.0	<1	NA
Alkalinity, total	168.0	44.0	<1	NA
Fluoride	0.28	0.21	0.14	4.0
pH	7.37	6.69	6.25	6.5 to 8.5
TSS	530.0	122.0	<1	NA
TDS	12,100.0	9,437.0	2,130.0	500.0*
Cyanide (WAD)	26.0	4.56	<0.005	0.2**
Cyanide (total)	3.76	2.16	0.49	0.2
Nitrate + Nitrite as N	56.0	12.3	<0.01	10.0
Ammonia as N	62.8	57.5	53.8	NA
Ortho-phosphate as P	0.193	0.069	<0.001	NA
Aluminum	0.5	0.144	<0.1	0.087†
Antimony	<0.003	<0.003	<0.003	0.006

Table 3-1 (continued)

PARAMETER	HIGH CONCENTRATION (mg/l)	AVERAGE CONCENTRATION (mg/l)	LOW CONCENTRATION (mg/l)	MONTANAA GROUNDWATER STANDARD (mg/l)
Arsenic	3.92	3.14	1.25	0.02
Cadmium	0.024	0.003	<0.0001	0.005
Chromium	0.011	0.004	<0.001	0.1
Copper	0.039	0.018	0.004	1.3
Iron	179.0	84.0	38.0	0.3*
Lead	<0.002	<0.002	<0.002	0.015
Manganese	11.1	7.66	6.29	0.05*
Mercury	0.0019	0.0007	0.0003	0.002
Nickel	1.63	0.6	0.17	0.1
Selenium	0.044	0.023	0.016	0.05
Silver	0.142	0.0145	<0.003	0.035
Zinc	1.02	0.38	0.05	2.1

Note: \* US EPA secondary drinking water standard.

\*\* Analyzed as total

† Surface water chronic aquatic standard



Table 3-2. Examples of Water Use Efficiencies

PLANT	UNITS OF WATER PER UNITS OF BIOMASS	GENERAL SOURCE REFERENCE
<b>TREES</b>		
Mesquite	1450	Mean of 4 studies
Oak	1196	Mean of 3 studies
Aspen	709	Ruark and Bockheim (1988)
Douglas fir	315	Mean of 4 studies
Lodgepole pine	180	Smit et al. (1992)
<b>SHRUBS</b>		
Creosotebush	3750	Mean of 3 studies
Bursage	3276	Sharifi et al. (1982)
Snakeweed	2378	Mean of 2 studies
Big sagebrush	2216	Sharifi et al. (1982)
Fourwing saltbush	984	Mean of 2 studies
<b>GRASSES</b>		
Kentucky bluegrass	1715	Weaver (1941)
Green needlegrass	1517	Mean of 3 studies
Ryegrass	1345	Mean of 3 studies
Western wheatgrass	1127	Mean of 9 studies
Smooth brome	955	Power (1971)
Little bluestem	945	Weaver (1941)
Slender wheatgrass	885	Fairbourn (1982)
Orchardgrass	859	Mean of 4 studies
Crested wheatgrass	858	Mean of 7 studies
Blue grama	744	Mean of 8 studies
Intermediate wheatgrass	735	Fairbourn (1982)
Thickspike wheatgrass	600	Fairbourn (1982)
Tall Fescue	523	Mean of 3 studies
Wheat	364	Mean of 7 studies
Buffalograss	296	Shantz and Pemeisel (1927)
Cheatgrass	273	Mean of 3 studies
Sorghum	251	Mean of 3 studies
<b>FORBS</b>		
Dandelion	2855	Humphrey (1962)
Red clover	1808	Mean of 2 studies
Hairy vetch	1113	Mean of 2 studies
Sweetclover	1060	Mean of 2 studies
Ragweed	1022	Shantz and Pemeisel (1927)
Alsike clover	787	Fairbourn (1982)
Alfalfa	772	Mean of 7 studies
Fringed sage	654	Shantz and Pemeisel (1927)
Curlycup gumweed	585	Shantz and Pemeisel (1927)
Sunflower	480	Mean of 5 studies
Cocklebur	415	Shantz and Pemeisel (1927)
Star thistle	371	Lof (1976)
Russian thistle	297	Mean of 4 studies
Pigweed	283	Shantz and Pemeisel (1927)

**Table 3-3. Soil Quality**

PARAMETER	SAMPLE Ids*			
	TS-1	TS-2A	TS-2B	TS-2C
Depth in inches	0-6	0-6	0-6	0-6
pH, s.u.	5.7	5.8	6.1	5.8
Nitrate-N, $\mu\text{g/g}$	34.4	6.6	47.1	40.0
Organic Matter, %	3.81	3.28	3.15	3.91
Phosphorus (Olsen) $\mu\text{g/g}$	23.5	20.8	20.0	22.8
Potassium, $\mu\text{g/g}$	348	303	304	349
Sodium, meq/100g	<0.1	<0.1	<0.1	<0.1
Calcium, meq/100g	0.3	0.1	0.2	0.2
Sulfate as S, $\mu\text{g/g}$	28	20	20	24
Conductivity, mmhos/cm	0.25	0.13	0.26	0.25
Texture	sand / loam	sand / loam	sand / loam	sand / loam

\* Native soils sampled prior to excavation for TSF construction.

**Table 3-4. TSF Cover Subsoil Characteristics**

PARAMETER	VALUE*
Texture	Loamy sand to loam; predominantly sandy loam
Permeability (double ring infiltrometer)	$1.19 \times 10^{-3}$ to $9.73 \times 10^{-5}$
Moisture Content (field – ASTM D2216)	6.6 to 14.8%
% Fines (passing 200 sieve)	44.9 to 87.8%
Bulk Density	77.7 to 110.2 lb/ft <sup>3</sup>

\* TSF borrow pit material.

**Table 3-5. EDYS Simulations of Drainage (gpm) through the TSF**

<b>YEAR FOLLOWING RECLAMATION</b>	<b>EXISTING PLAN</b>	<b>APPLICANT'S PROPOSED PLAN – PLANTED DOUGLAS FIR SEEDLINGS</b>
01	0.108	0.108
02	0.074	0.080
03	0.218	0.181
04	0.005	0.000
05	0.124	0.008
06	0.112	0.282
07	0.599	0.783
08	0.180	0.045
09	0.828	0.328
10	0.853	0.487
11	0.069	0.018
12	0.155	0.093
13	0.035	0.000
14	0.087	0.000
15	0.309	0.095
16	0.193	0.081
17	0.267	0.141
18	0.04	0.000
19	0.03	0.000
20	0.096	0.000
<b>Annual Mean</b>	<b>0.219</b>	<b>0.136</b>

Cover design for Applicant's Proposed Plan – Douglas fir planting = 12 inches of topsoil over 36 inches of sand/gravel.

Cover design for Existing Plan = 12 inches topsoil, 3 inches sand/gravel, 9 inches bentonite clay amended compacted tailings.

Table 3-6. 1300 Adit Water Quality (dissolved metals)

PARAMETER	HIGH CONCENTRATION (mg/l)	LOW CONCENTRATION (mg/l)	AVERAGE CONCENTRATION (mg/l)	GROUNDWATER STANDARD (mg/l)
Calcium	147	48	105	NA
Potassium	15	7	10	NA
Sodium	18	11	13	NA
Magnesium	51	15	30	NA
Sulfate	422	51	217	250*
Chloride	51	3	16	230
Carbonate	1	<1	<1	NA
Bicarbonate	217	41	171	NA
PH	8.31 s.u.	7.0 s.u.	7.79 s.u.	6.5 to 8.5 s.u.
Nitrate + Nitrite	25	1	9	10
CN Total	0.024	<.005	0.001	0.2
CN WAD	0.019	<.005	0.0048	0.2**
Arsenic	0.653	0.18	0.506	0.02
Cadmium	0.006	<.0001	0.0011	0.005
Chromium	0.001	<.001	0.0001	0.1
Copper	0.008	<.001	0.0024	1.3
Iron	0.97	<.01	0.192	0.3*
Lead	0.002	<.001	0.00011	0.015
Selenium	0.003	<.001	0.0016	0.05
Silver	<.003	<.003	<.003	0.035
Thallium	<.003	<.003	<.003	0.002
Zinc	0.04	<.01	0.014	2.1

\* US EPA secondary drinking water standard

\*\* Analyzed as total

Table 3-7. Reclamation Bond Summary

ITEM	EXISTING PLAN 1999 BOND		EXISTING PLAN RECALCULATED BOND		APPLICANT'S PROPOSED PLAN	AGENCY MODIFIED PLAN
<b>Direct Costs:</b>						
<i>Item # 1 Facilities</i>	\$ 530,651		\$ 546,000		\$ 732,000	\$ 732,000
<i>Item # 2 Tailings Storage Facility</i>	\$1,814,779		\$ 575,000		\$ 341,000	\$ 341,000
<i>Item # 3 Old Tailings South</i>					\$ 3,080	\$ 3,080
<i>Item # 4 Roads</i>	\$ 168,531		\$ 227,000		\$ 221,000	\$ 221,000
<i>Item # 5 Underground Openings</i>					\$ 49,000	\$ 50,000
<i>Item # 6 Development Rock Piles</i>	\$ 395,582		\$1,027,000		\$ 455,000	\$ 455,000
<i>Item # 7 Miscellaneous</i>	\$ 215,879		\$ 179,000		\$ 42,000	\$ 86,000
<i>Item # 8 Interim Maintenance and Shutdown</i>	\$ 34,000		\$ 408,000		\$ 2,500	\$ 2,500
<i>Item # 9 Site Management During Reclamation</i>					\$ 500,000	\$ 500,000
<b>Subtotal</b>	\$3,159,422		\$2,962,000		\$2,345,580	\$2,390,580
<b>Indirect Costs:</b>						
<i>Contingencies</i>	0%	0	5%	\$ 148,100	\$ 117,279	\$ 119,529
<i>Mobilization</i>	1%	\$ 31,594	5%	\$ 148,100	\$ 117,279	\$ 119,529
<i>Engineering</i>	2%	\$ 63,188	5%	\$ 148,100	\$ 117,279	\$ 119,529
<i>Agency Administration</i>	15%	\$ 473,913	5%	\$ 148,100	\$ 117,279	\$ 119,529
<i>Inflation (4% over 5 years)</i>	3%	\$ 505,507	22%	\$ 651,640	\$ 516,028	\$ 525,928
<b>Total Reclamation Bond Amount</b>	\$4,233,626		\$4,206,040		\$3,330,724	\$3,395,000
<b>Water Treatment Bond</b>	\$3,373,200 <sup>1</sup>		\$4,478,000		\$6,383,000	\$6,419,000
<b>Grand Total</b>	\$7,606,826 <sup>2</sup>		\$8,684,040		\$9,713,724	\$9,814,000

<sup>1</sup> \$1,124,400 due by July 1, 2001<sup>2</sup> Current bond posted is \$7,607,202



Table 4-1. List of MDEQ Preparers

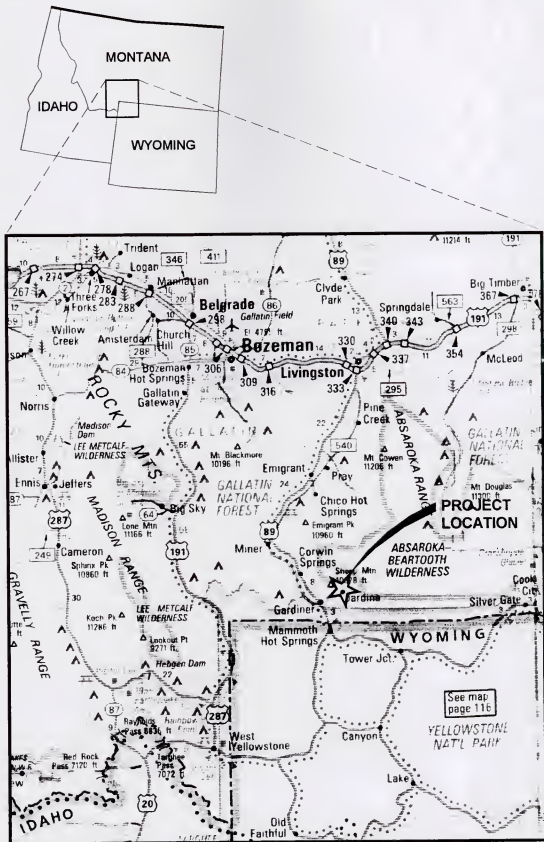
Name	Responsibility	Credentials	Years Experience
Patrick Plantenberg	Vegetation, Soils, Reclamation, Recreation, EIS Preparation	BS, Agricultural Science/Recreation Area Management MS, Range Science/Reclamation	25
Charles Freshman	Engineering, EIS Preparation	BA, Geology BS, Civil/Environmental Engineering MS, Mining/Geological Engineering	20
Peter Werner	Bond Preparation Mine Engineering	BS, Geology & Civil Engineering MS, Mining Engineering	17
Laura Kuzel	Geochemistry	BS, Geology MS, Geology	8
Joe Gurrieri	Hydrology, Cultural Resources	BA, Geography MS, Geology	16
Greg Hallsten	EIS Reviewer	BS, Wildlife Biology BS & MS, Range Management	25
Warren McCullough	EIS Reviewer, Geology	BA, Anthropology MS, Economic Geology	28
Shellie Haaland	EIS Editor and Reviewer	BS, Natural Resource Conservation	7
Jade Nicolay	EIS Editor and Reviewer	Business Administration Administrative Support	6
Tina Engel	EIS Editor and Reviewer	Business Administration Administrative Support	7



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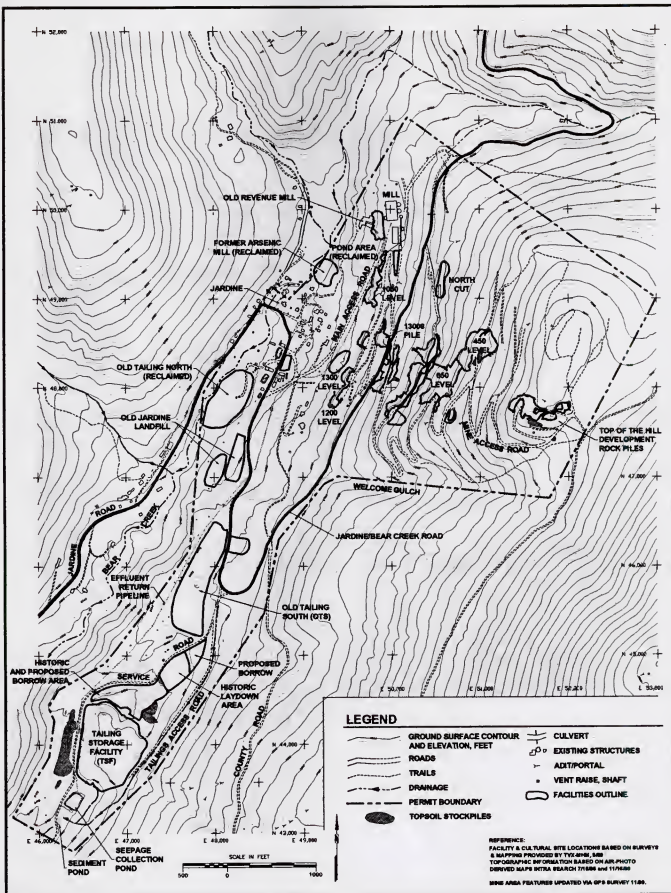
**FIGURES**





**Figure 1-1  
Project Location Map**

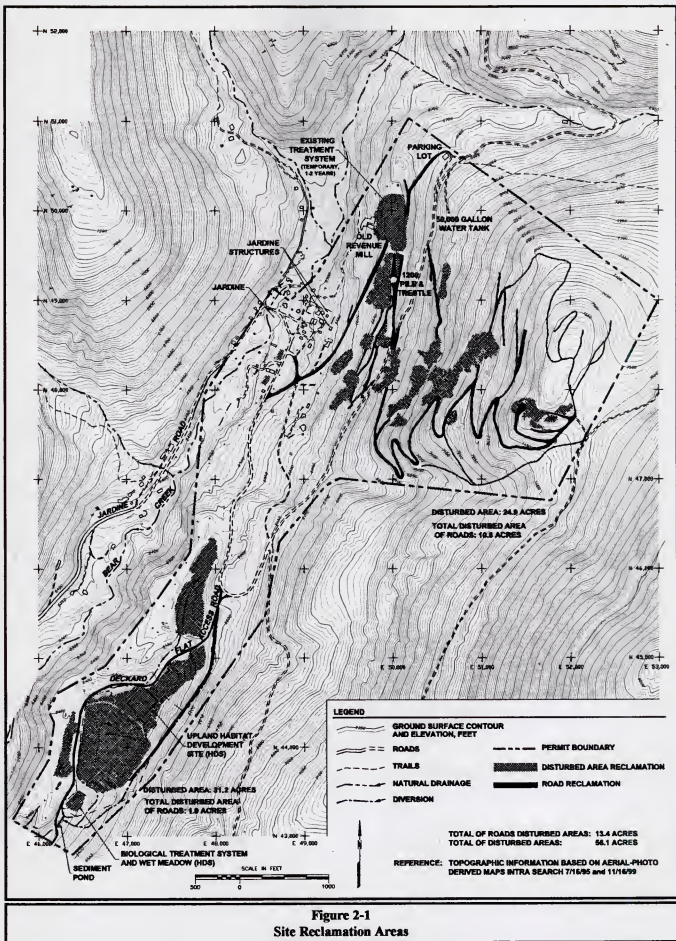




**Figure 1-2**  
**Mineral Hill Mine – Project Permit Area and Facilities**

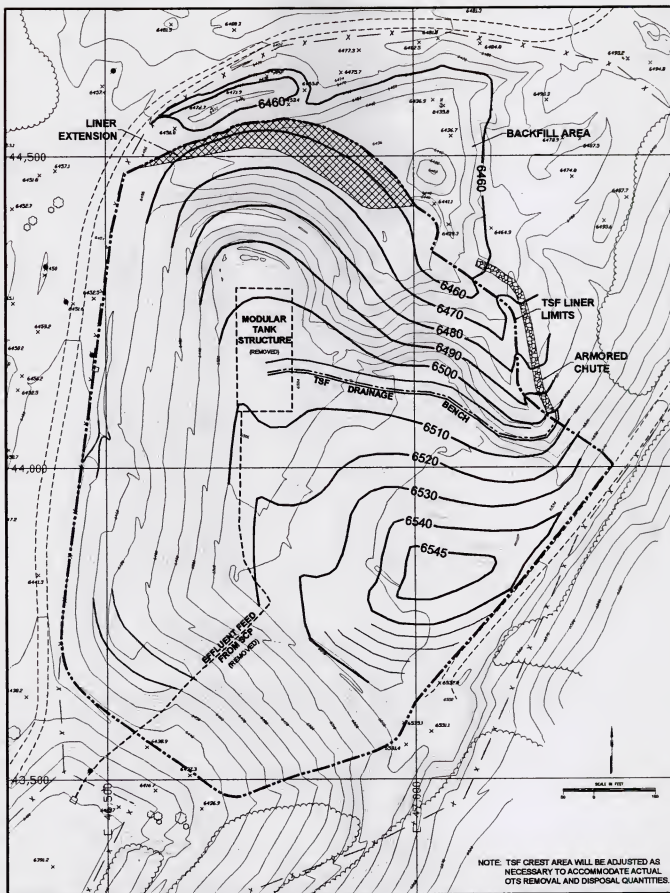






**Figure 2-1**  
**Site Reclamation Areas**





**Figure 2-2**  
**TSF Regrading Contours**



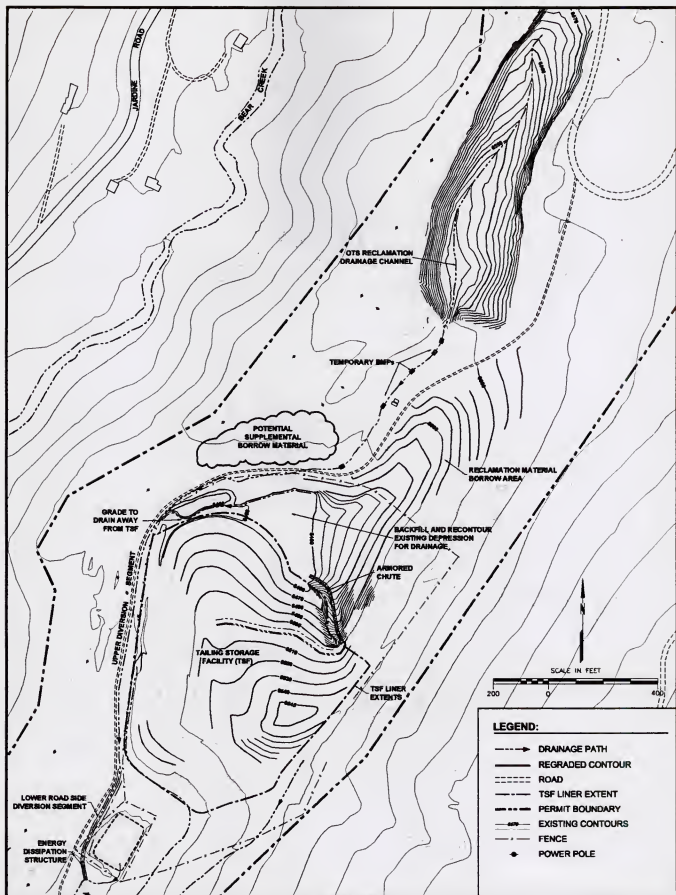
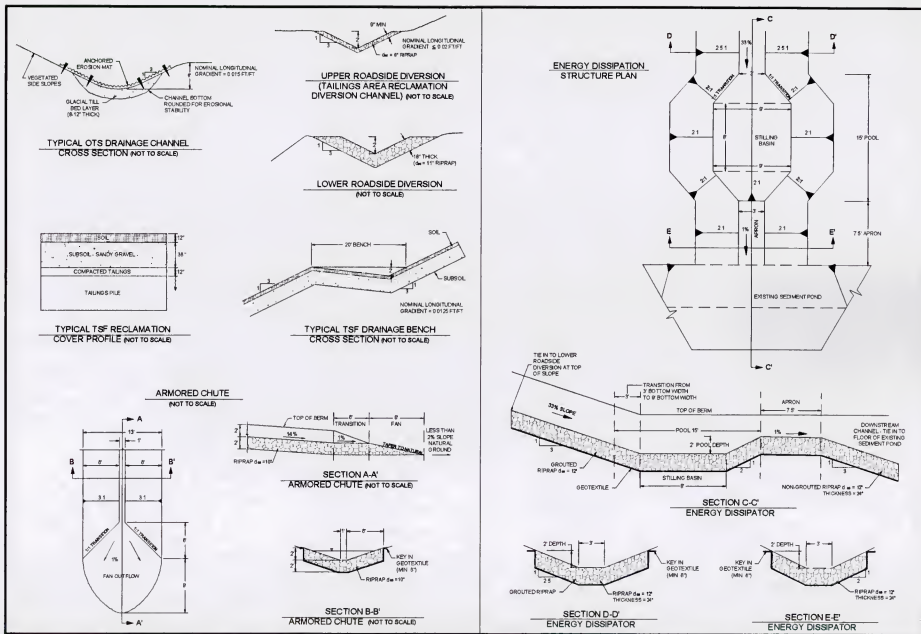


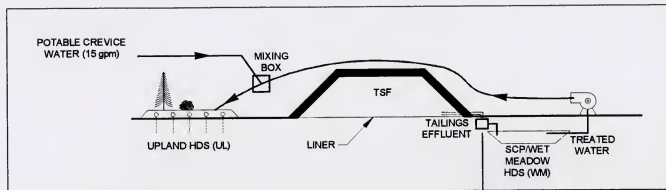
Figure 2-3  
OTS Drainage Plan and TSF Area Reclamation and Drainage











BIOLOGICAL  
TREATMENT  
SYSTEM

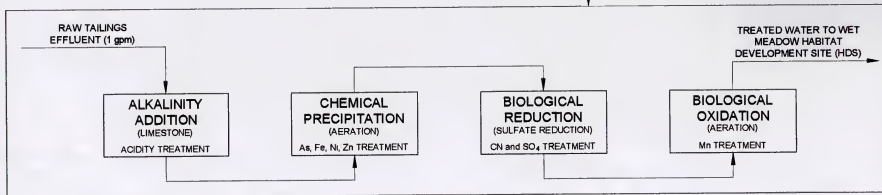


Figure 2-5  
Tailings Seepage Management



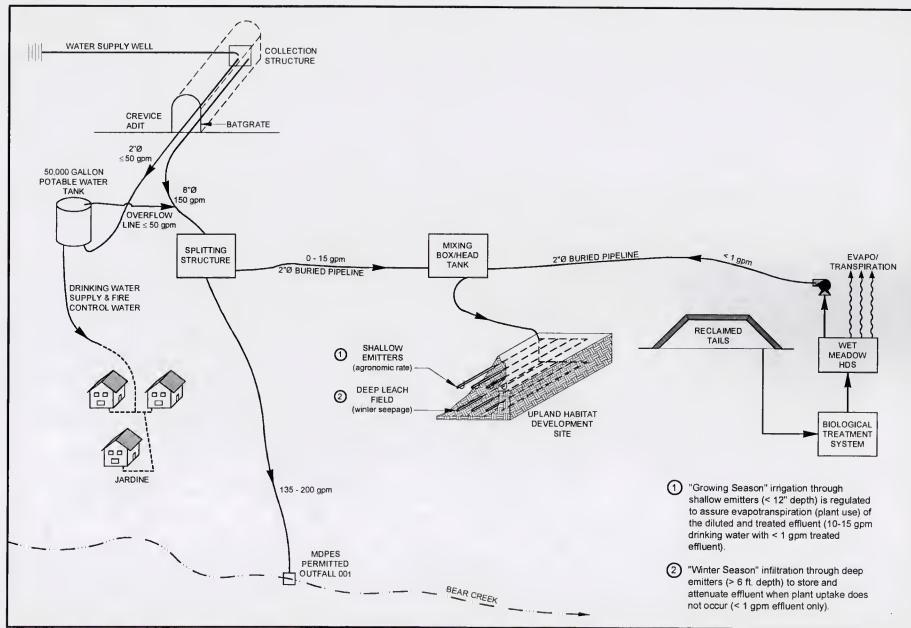


Figure 2-6  
Water Routing



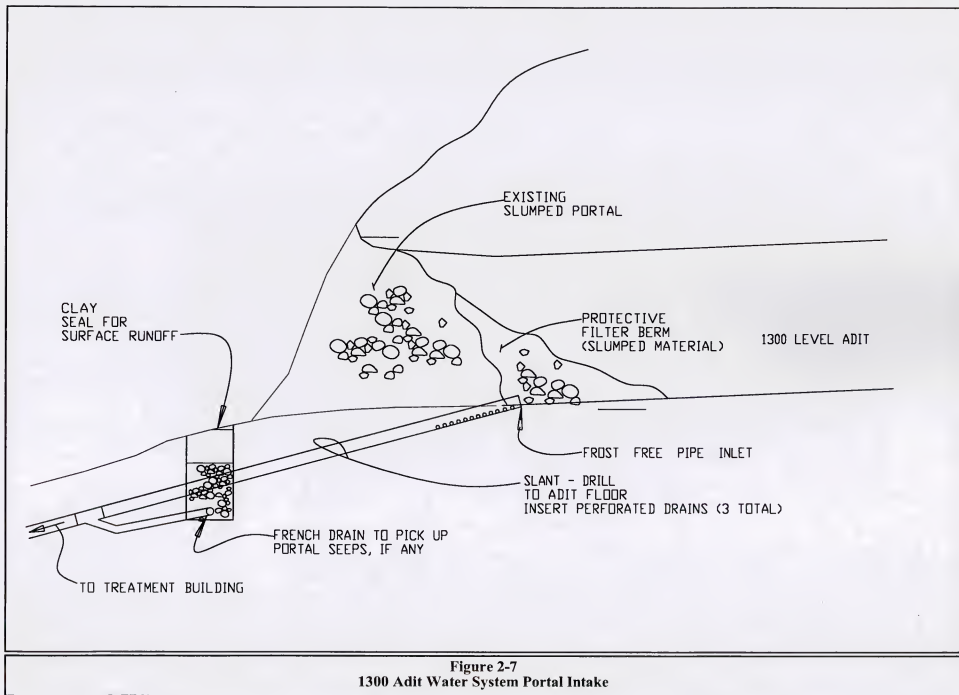
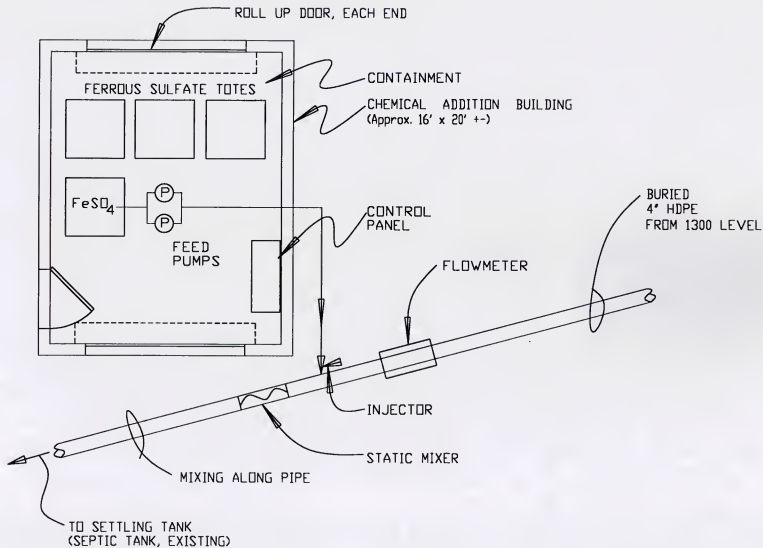


Figure 2-7  
1300 Adit Water System Portal Intake







**Figure 2-8**  
**1300 Adit Water System Pre-treatment**



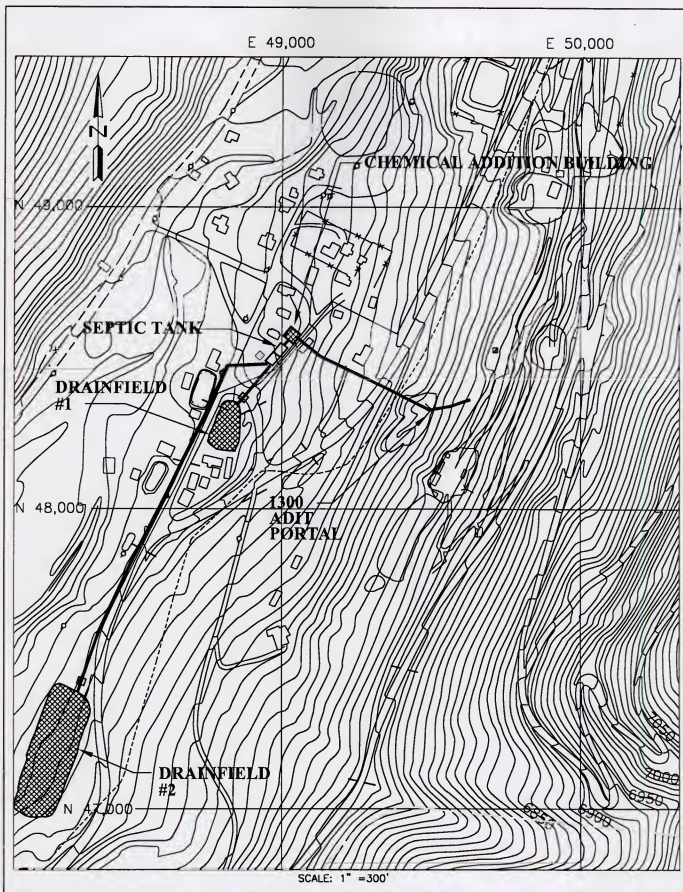


Figure 2-9  
1300 Adit Water Management Plan









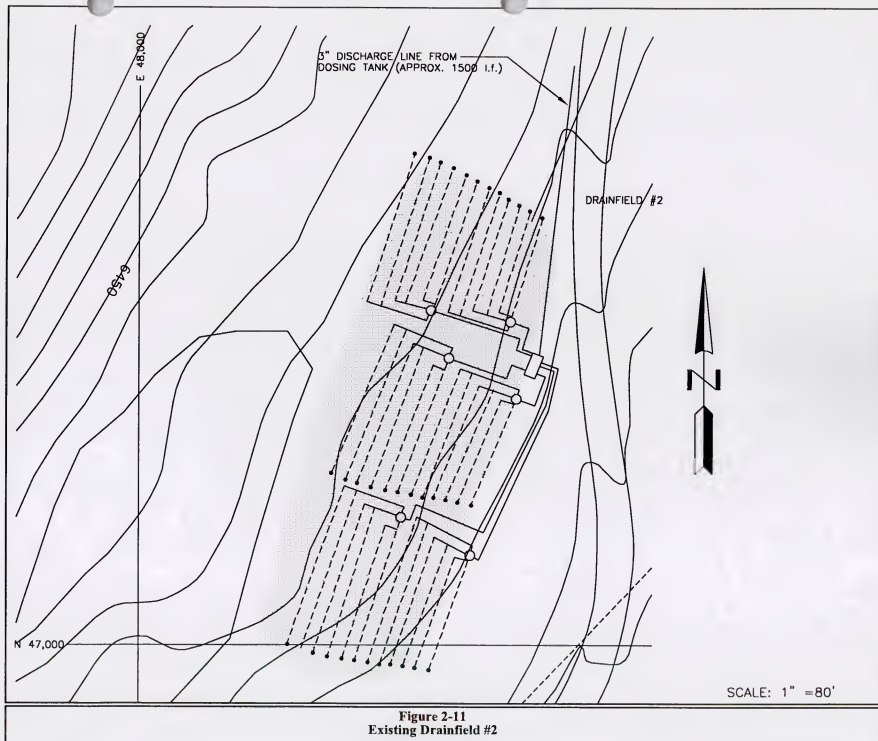


Figure 2-11  
Existing Drainfield #2



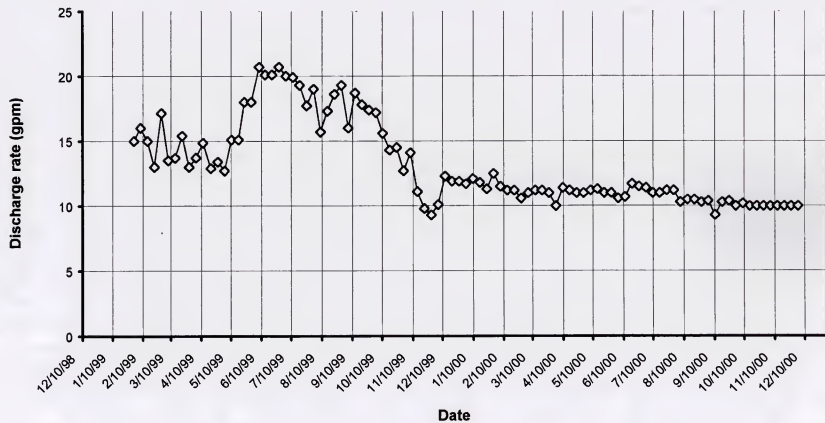
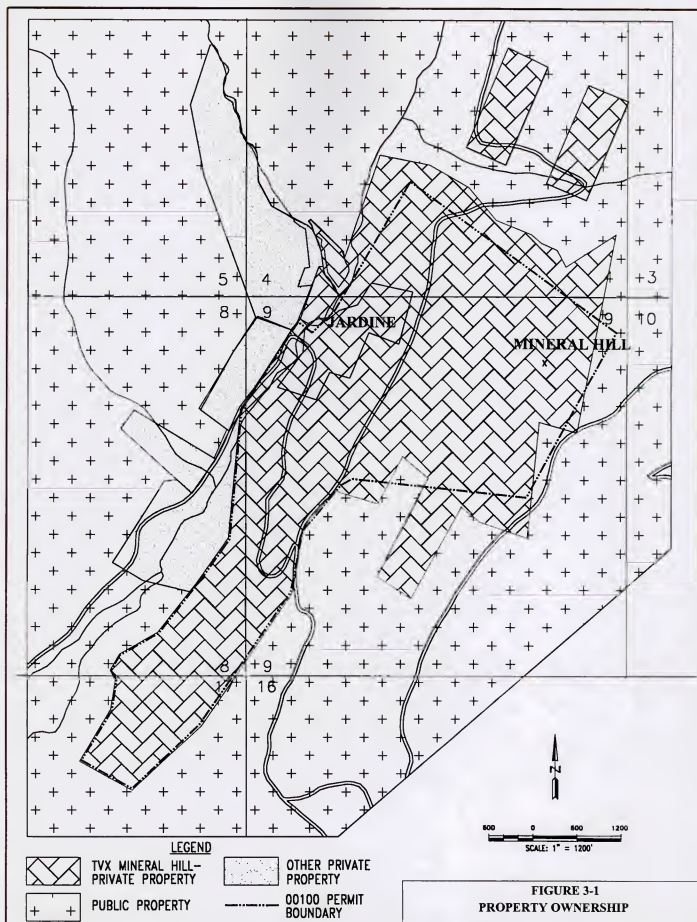


Figure 2-12 1300 Adit Discharge Rate







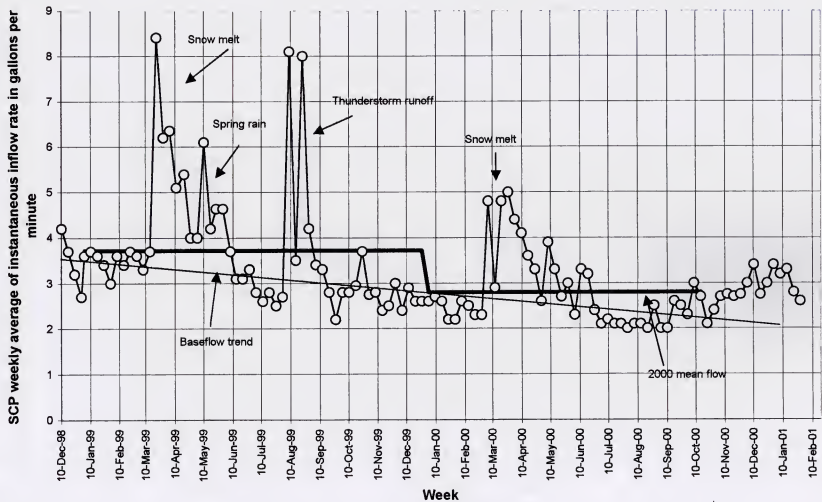
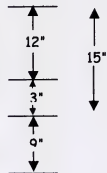
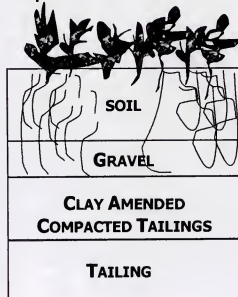


Figure 3-2 SCP Weekly Averages of Instantaneous Daily Inflow Rate





Existing plan – water barrier cap



Applicant's proposed plan – water balance cap

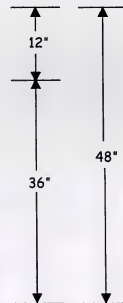
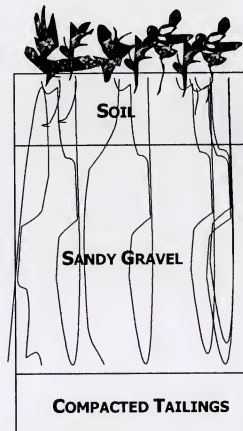


Figure 3-3 Tailings Cover Design Columns



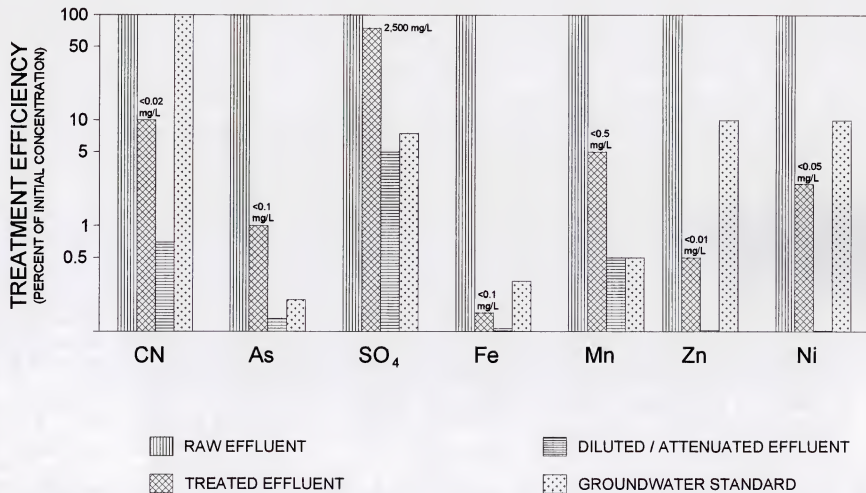
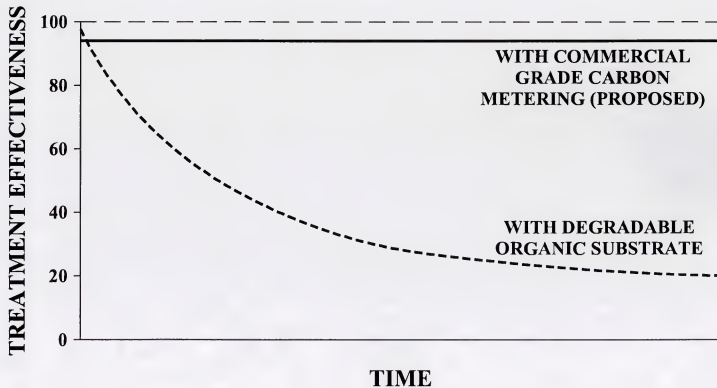


Figure 3-4  
Anticipated TSF Biological Treatment System Performance





**Figure 3-5**  
**Comparison Between Effectiveness of Alcohol Addition Versus Manure Substrate**





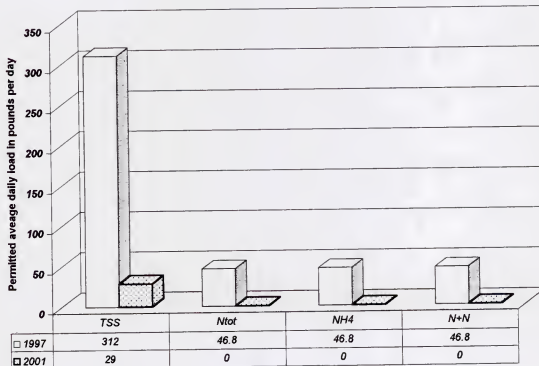
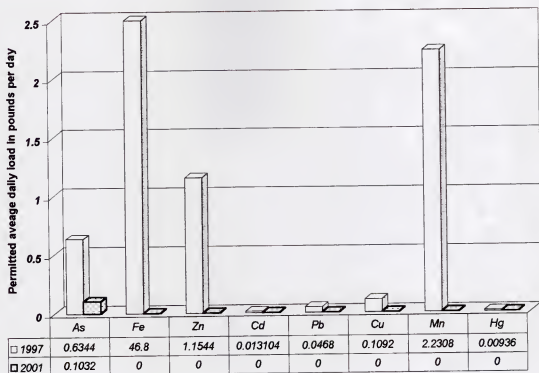


Figure 3-6 Average Effluent Loading from Outfall 001 Crevice and 1300 Adits



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*CONSOLIDATED CLOSURE PLAN MODIFICATIONS*

**APPENDICES**



**APPENDIX A**

**ISSUE DISPOSITION SUMMARY**

**FOR THE**

**MINERAL HILL MINE**

**CONSOLIDATED CLOSURE PLAN**



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# APPENDIX A - ISSUE DISPOSITION SUMMARY

## INTRODUCTION

The Montana Environmental Policy Act (MEPA) provides for identification and elimination from detailed study those issues which are not significant or which have been covered by prior environmental review. This narrows the discussion of those issues to a brief presentation of why they would not have a significant effect on the human environment or providing a reference to their coverage elsewhere (ARM 17.4.615(2)(c)).

Scoping identified a total of 20 issues that could be relevant to the proposed Mineral Hill Mine (MHM) Consolidated Closure Plan (CCP). Each issue was considered by the interdisciplinary team (IDT) to determine its disposition (how/if it is related to the project under the proposed action and the level of potential impact). As a result, each issue was classified into one of the following disposition categories: 1) dismiss as irrelevant; 2) dismiss as outside or beyond the scope of the project; 3) eliminate from detailed study due to known minor or no effects; 4) eliminate from detailed study due to effective mitigation or project design changes; or 5) carry forward and treat as a significant issue.

This document discusses two alternatives: 1) the existing approved reclamation plan, which will be called the "Existing Plan" and 2) the Mineral Hill Consolidated Closure Plan which will be called the "Applicant's Proposed Plan" throughout this document. Other alternatives may eventually be developed in the analysis to address parts of various issues.

The issues and their disposition in this environmental impact statement (EIS) are summarized below. Issues carried forward are discussed in greater detail at various places in the document. Cross-references are provided.

Individual scoping comments have been summarized to facilitate the issue discussion. Issue discussion follows the individual comment summaries.

### ISSUE 1. TAILINGS STORAGE FACILITY (TSF) - BIOLOGICAL TREATMENT SYSTEM, CAP DESIGN

#### Biological Treatment System

##### Summary of Comments

Note: DEQ has paraphrased the comments received from the public below with a minimum of edits.

- Will the biological passive treatment system perform and reduce contaminant levels as claimed?
- Will the habitat development sites (HDS) which depend on subirrigation perform within design specifications and not cause ground water contamination?
- What are the long-term maintenance implications and costs for the biological passive water treatment system?
- *Volume 1, Page 26:* The text states that details for the passive seepage management system "... will be generated through additional study." Those details are needed before a final design is approved and implemented.
- *Volume 1, Page 56:* The anaerobic treatment system design is based upon a 1.0 gpm (1,440 gallons per day (gpd)) seepage rate. It also states that when the seepage rate falls to or below 1.0 gpm consistently, the anaerobic systems would be constructed. What is the time frame for measuring a "consistent" seepage rate? What contingency is planned should the rate increase above 1.0 gpm after the backup RO water treatment system is dismantled?
- *Agronomic Rates:* Are agronomic rates the basis for discharging this water? What about pumps, meters, pipelines, wells, lysimeters, winter conditions, and humans to do all this post-closure work?
- *Discharge to Ground:* What about regulatory issues, ground water mixing, metals attenuation, and cyanide/nitrates? Metals attenuation did not work below the Seepage Pond. Why will it now?
- *Alluvial Material:* What about the heterogeneous glacial till in the area. There are clay lenses everywhere that can pipe this water to unknown locations including the steep slopes above Bear Creek.
- *Wastewater discharge from the tailings impoundment underdrain system (seepage collection), handling, treatment, disposal, monitoring and permitting:* Specific, detailed monitoring and reporting plans and schedule, contingency plans and systems, maintenance schedules and costs, and duration of anticipated activities must all be outlined in detail and analyzed.

- ° Until the R/O is decommissioned and the TSF reclaimed, what about emergency storage for Tailings Pond seepage and runoff. Emergency storage used to be an issue with DEQ. The two mill ponds are gone, but this winter's snowpack is well below average. I guess it's better to be lucky than prepared.
- ° *Appendix 2, MPDES Permits:* How will the MPDES permits be administered post-closure and who will hold the permits, assure permit compliance, report results and bear the costs?

#### Issue Discussion

The operator has maintained that the existing approved reclamation plan is adequate and the Tailings Storage Facility (TSF) would drain down to 1.0 gpm or less. This water could then be land applied and the regulated water quality constituents attenuated in the soil prior to reaching ground water. DEQ has remained skeptical of this proposal and has bonded for 3 years of reverse osmosis (RO) treatment in the existing reclamation bond. At the request of DEQ, the operator initiated soil studies in 1998 to determine if the TSF seepage could be infiltrated as a contingency to the approved reclamation plan. In 1999, TVX initiated soil column leach studies to determine the effectiveness of passive biological treatment to treat TSF seepage. The TSF seepage is a key component of long-term water management.

The column leach studies have shown that the use of an infiltration gallery to discharge the TSF seepage to soil would provide for attenuation of some, but not all, regulated constituents before the discharge reaches ground water. Attenuation alone is not adequate treatment for discharge to soil.

Separate bench scale studies were performed to test the effectiveness of anaerobic and aerobic passive biological treatment of the TSF seepage. Metals and nitrogen compounds were effectively removed by the anaerobic system. Arsenic was removed at 90-99 percent efficiency. Only arsenic, sulfate, and total dissolved solids (TDS) exceeded water quality standards in the effluent. Residual iron and arsenic were shown to readily precipitate, in the aerobic experiments.

As a result of these studies, TVX has proposed a way to treat TSF seepage at closure using a passive biological treatment system and disposal of the water after treatment in a wet meadow HDS. In wet years if seepage overflows the wet meadow HDS, the applicant proposes to dilute the biological treatment system effluent with approximately 15 gpm of Crevice Adit water and apply the mixed water to land application sites at less than a defined agronomic application rate.

Adequate land area is available to construct a total of four 2,000-square-foot upland HDS plots. By rotating water application between these four HDS plots, the applicant believes discharge to ground water would be unmeasurable; that is, almost all the water would be retained in the soil column and evapotranspired by the reclaimed plant community. TVX believes water quality of the mixed water would meet state water quality standards, and no degradation of state ground water would result if some irrigation water percolates to ground water.

The applicant is confident in the capability of the passive biological treatment system and HDS land application system to protect surface and ground water quality. A conservative approach to long-term financial surety would be taken. Adequate bond would be required to operate and maintain the passive biological treatment system, as well as perform periodic major maintenance, including complete replacement of the media.

The reverse osmosis treatment plant would remain in place until the MPDES permit for Outfall 002 and other contingency plans for other discharges utilizing the plant are retired. Nothing in the state action under consideration in this EIS has any effect on the requirement to maintain compliance with Outfall 002 in the MPDES permit. The applicant is responsible to maintain that permit. DEQ maintains a water treatment bond in the event the applicant does not fulfill its obligations under the operating permit.

The treatment plant currently operates on a 10-hour-per-day, 5-day per week schedule. With this schedule, the plant yield is just over 2.0 gpm on a 24-hour basis. The TSF seepage rate is also just over 2.0 gpm on a 24-hour basis, indicating the plant is operating in balance with the wastewater generation rate. Additional capacity is readily available to treat seasonal runoff peaks.

The operator has at least two alternatives to maintain compliance with the MPDES permit. First, the existing RO system would be maintained and the treated water would be discharged to Outfall 002 under the MPDES permit. Second, the applicant has indicated that the propane-fired evaporator could be employed to evaporate up to 3.0 gpm on a 24-hour basis. Confirmation of permitting requirements with DEQ Air and Waste Management Bureau is suggested prior to initiating such action. In this case, the Bear Creek discharge would be eliminated, and the applicant could request elimination of Outfall 002 from the MPDES permit.

TSF seepage is currently collected in the seepage collection pond (SCP) below the TSF. Following capping of the TSF, runoff from the TSF would become

storm water. Storm water would be controlled through Best Management Practices (BMPs) and discharged under the construction storm water permit. Storm water would not report to the SCP for treatment. Residual drawdown of the pile should reduce the TSF seepage from the current 2.0 gpm to less than 1.0 gpm relatively quickly.

The time required to reach less than 1.0 gpm is immaterial to DEQ. Timing of the treatment plant removal is useful to the possible state action considered in this EIS, but removal of the treatment plant is not an action being considered. The applicant has indicated it plans to remove the structures beginning in the second quarter of 2001, but this in no way affects the requirement to maintain and comply with the MPDES permit.

The applicant has indicated it would perform additional experimental work to help determine long-term maintenance requirements.

*Carry forward and treat as a significant issue:* The performance of a pilot-scale system shows promising results. However, DEQ can not conclude at this time that the proposed TSF passive biological treatment system will perform as expected and protect surface and ground water resources consistent with Montana water quality standards, including non-degradation. Further testing is needed for the DEQ to make a final decision on whether to approve the system. The Existing Plan to allow the TSF seepage to improve with time does not provide adequate water quality protection. Therefore, the TSF seepage treatment system would be a significant factor in determining the preferred alternative, and this issue will be carried forward into Chapter 3.

## TSF Cap Design

### Summary of Comments

Note: DEQ has paraphrased the comments received from the public below with a minimum of edits.

- Will the new cap design limit infiltration as well as, or better than, the existing cap design?
- *Volume 1, Page 29:* The text refers to "The evolving details of the TSF reclamation..." It also refers to "...soil information that will be updated as the test plots are initiated." Complete information is needed before the final design is approved and implemented.
- *Volume 1, Page 51:* The text states that "Where practical, tests will be conducted to evaluate alternative revegetation strategies." Appendix 5, Revegetation Test Plot for the TVX MHM CCP

describes a test to determine the optimum depth for tailings revegetation. Assuming the test plot was established in late 1999 or early 2000, this will allow only one growing season prior to proposed large-scale revegetation in the tailings area in late 2000. The proposed water balance cap design will have already been constructed before the revegetation test results are known. What happens if the revegetation fails? The revegetation trials include irrigation to improve success of desired species. Is this an acceptable action for the TSF? What keeps the tailings dry while the vegetation gets established?

- *Water Balance Model:* We were not able to find documentation of the model used to generate the proposed "water balance" design for keeping the tailings dry. We are very much interested in reviewing the assumptions and output from this model.
- *Tailings Storage Facility:* As Environmental Superintendent at MHM, I commissioned a study to look at water balance covers for this facility. Maxim Technologies, Inc. undertook this study and determined that the alluvial material within the present TSF footprint would not be suitable as a cover material because it was too coarse. Although Maxim Technologies, Inc. used the HELP model for predicting water balances, they looked at several scenarios of cap thickness. Maxim Technologies, Inc. concluded no reasonable thickness of alluvial material would preclude precipitation from contacting the tailings. I believe TVX is proposing to use available material for the 36-inch component of the cap. I cannot speak to the differences between HELP and EDYS, but clearly the final solution to the TSF cap is still unresolved.
- *Revegetation:* Great plan except for the never resolved issue of trees being planted, or volunteering, on the TSF. Sooner than later, the cap will be compromised.
- *Revised design of the cap on the tailings impoundment:* Thorough attention must be given under MEPA to review and analysis of this major proposed reclamation plan change. Specific, detailed monitoring and reporting plans, contingency plans and systems, maintenance schedules and costs, permit maintenance, and duration of anticipated activities must all be detailed and analyzed. Note that previous, credible third-party technical review of the efficacy of a water-balance cap at MHM concluded that on-site materials were unsuitable. Modeling suggested that no practical thickness of the readily-available

pit-run material would function as a WB [water balance] cap. In what way is TVX's new hydrologic model superior to the previous model? Same on-site material, same data, different consultant, different model equals new answer favorable to the company's new position... Fitting data to pre-determined conclusions? Making optimistic assumptions in hydrologic models where only the most conservative credible assumptions are appropriate? The issue of long-term ("perpetual") reclamation cap integrity and durability is far too important to accept this conclusion - with its appearance of bias - without careful review of the matter. The issue is so critical to long-term protection of Bear Creek and area ground water that DEQ should retain a third party consultant to review data, operational history, and design and to make recommendations.

- Little consideration has been given (in the present or original iteration of the reclamation plan) to the long-term impact on the cap of the penetrating roots of conifers and shrubs that will inevitably colonize the cap. Further, when mature conifers are tipped over by wind, decadence or otherwise, a large hole is opened in the soil surface. This will eventually provide multiple points of significant failure in the cap. Potholes thus created will provide for collection and infiltration of precipitation and melt water. This is a long-term problem, which would not become apparent for many, many years. This is one illustration of the need for long-term post-closure site monitoring. Neither the original nor the revised reclamation plans incorporate analysis of these problems. In fact, TVX's revised plan calls for *planting* conifer seedlings on the cap (probably Douglas fir, which grows locally to great size). This example of oversight alone demonstrates the need for review under MEPA of the entire reclamation plan.
- So far there appears to be two proposals for dealing with the tailings storage facility and two more for reclamation of the historic old tailings south unit. Will the analysis discuss, in detail, the advantages and disadvantages of each of these alternatives?

#### Issue Discussion

The TSF was designed and built to isolate the tailings from the environment to the extent practicable. Isolation measures include a double underliner, a low-permeability cap and a drainage collection and capture system, and surface water runoff diversion. At issue is the design of the low-permeability cap.

The alternatives differ in this regard. Design work, using computer simulation models, has been performed in the past and is a component of the Applicant's

Proposed Plan. The Existing Plan considers a thinner cover that includes a layer into which bentonite clay has been mixed to produce a low-permeability layer. Concerns regarding this design include: adequate cover to prevent frost damage and desiccation, shallow slope stability of a saturated low-strength layer within the soil column, and root penetration into the clay layer, vegetative community succession, long-term removal of trees, grazing effects, fires, and climatic influences on the cover vegetation.

The Applicant's Proposed Plan includes a water balance cap that does not rely on a low-permeability layer, but rather uses a thicker soil column for soil moisture storage and a vegetative cover to remove the stored water through evapotranspiration, as well as soil surface evaporation. Concerns regarding this design include: vegetative community succession and change in plant water utilization as the plant community matures, tree overturning and rootwad divots, grazing effects, fires, and climatic influences on the cover vegetation.

*Carry forward and treat as a significant issue:* In order to evaluate these important factors and determine the environmentally preferred alternative, this issue is considered significant to the *Chapter 3* analysis.

#### **TSF Stability**

##### Summary of Comments

Note: DEQ has paraphrased the comments received from the public below with a minimum of edits.

- *Volume 1, Page 30:* The text states that the design of the contoured tailings pile and underlying foundation is adequate under static conditions. What is the minimum size earthquake that would cause slope failure?
- Will there be increased erosion or stability problems with a steeper slope on the north face of the tailings storage facility?
- Regrading the TSF to 3:1 slopes will provide stable slopes. Geotechnical and slope stability studies confirm stability up to the 1000-year earthquake. Shallow soil slips could occur in larger events, but soil strength could increase as the woody vegetation becomes established. Rooting could penetrate through the cap and into the underlying tailings, imparting significant apparent cohesion to the soil profile.

#### Issue Discussion

The old tailings south (OTS), a historic tailings deposit near the TSF, was reclaimed in 2000 and moved to the TSF. The resultant TSF final slopes ended up meeting

or exceeding the approved design parameters already approved in the Existing Plan. As a result, TVX has withdrawn the proposal to change the final regrading of the TSF.

*Dismiss as irrelevant:* TSF stability changes are now moot. Therefore this issue will not be carried forward in the EIS.

## Issue 2. Historic Structures and Features

### Summary of Comments

Note: DEQ has paraphrased the comments received from the public below with a minimum of edits.

- Are there any portals or waste rock piles in the Jardine Historic District that have historical interest?
- *Volume 1, Page 33:* TVX proposes to defer the decision on whether to remove the Revenue Gold Mill and associated spilled lime and boiler slag to discussions with DEQ and any prospective post-closure landowner, in the context of the long-term disposition of the patented property. The fate of this structure and the “undesirable materials” should be included in the Environmental Analysis and not deferred.
- *Removal of the historic “Red Mill” (or “Revenue Mill”).* It would be grossly inconsistent and illogical to remove lesser mining-related features and sites as public hazards, while leaving this huge, dangerous, collapsing building – the very definition of an attractive nuisance. Proper historic characterization and documentation (per federal standards) are an appropriate and accepted mitigation for removal of this historically significant building. Failure to include analysis of this obvious, major safety issue in MEPA review of either the original or the revised reclamation plans provides another graphic example of the current need to review the entire, original reclamation plan within MEPA.
- Reclamation of historic tailings and workings including those at Crevice should be analyzed.
- The plan appears to propose to abandon the Revenue Stamp Mill (Red Mill) in its current condition. While originally identified as an historic structure we believe it was documented and, given its current state of instability, could it now be removed before somebody gets hurt. Will the plan analysis consider removal of the Red Mill?

### Issue Discussion

During permitting of the MHM, a comprehensive cultural inventory and mitigation plan was prepared. 165 historic structures and features were identified. The Jardine Historic District, eligible for listing on the National Register of Historic Places, contained 49 of those structures and features. During construction and operation of the mine, some of the structures and features were removed, or they have deteriorated and collapsed. Many remain, including several that were determined to be significant to the historical integrity of the district.

A cultural resource impact management plan was prepared in 1984 (HRA, 1984). It is an enforceable component of Operating Permit 00100. The Existing Plan states that the Revenue Mill would be secured from entry and preserved. The Revenue Mill has partially collapsed from winter snow loads, parking lot expansion and snow pushed off the parking lot against the mill. None the less, the operating permit, which incorporates the cultural resource impact management plan, requires the operator to retain the structure. The Revenue Mill continues to play a significant role in the historic interpretation of local mining history. The Applicant’s Proposed Plan does not suggest changes to the status of the Revenue Mill and the cultural resource impact management plan. The status of the Revenue Mill is not considered significant to the analysis in this EIS.

No other historic structure or feature reclamation was required under the approved Operating Permit 00100. The applicant has voluntarily offered to reclaim 12 historic mine workings that it feels constitute safety hazards. None of these workings are listed as significant features in the Jardine Historic District. Federal takeover of the site may have implications for the disposition of the historic structures. This federal takeover of the site is outside the jurisdiction of the Metal Mine Reclamation Act.

*Dismiss as outside or beyond the scope of the project:* TVX has been coordinating with the USFS and DEQ on proposed plans for the historic structures. This cooperation is to ensure that historic sites are not disturbed if they would play an integral part in future use of the site by the USFS. As a result of this cooperative review outside the scope of this EIS, this issue is not carried forward in this EIS.

## Issue 3. Crevice Adit Water System Design

### Summary of Comments

Note: DEQ has paraphrased the comments received from the public below with a minimum of edits.



- What are the long-term maintenance implications and costs for this [Crevice and 1300 water systems] proposal?
- How does this new proposal compare to the impacts resulting from the existing MPDES discharge to Bear Creek? Should the existing discharge to Bear Creek be maintained for the long term?
- *Appendix 2, MPDES Permits:* How will the MPDES permits be administered post-closure and who will hold the permits, assure permit compliance, report results and bear the costs?
- *Volume 1, Page 53:* The text states that additional research and design work is planned in support of water management options for the Crevice Adit and the 1300 Adit, although "adequate information is presented in the appendices to facilitate an informed decision on the conceptual design." If the information is adequate, why is additional research planned? If this data is needed for a risk analysis, complete information should be obtained before design approval.
- Wastewater discharge from the Crevice Tunnel, handling, treatment, disposal, monitoring and permitting: Specific, detailed monitoring and reporting plans and schedules, contingency plans and systems, maintenance schedules and costs, and duration of anticipated activities must all be outlined in detail and analyzed.
- Plans for the Jardine town site public drinking water and fire suppression water supply systems: Specific, detailed monitoring and reporting plans, contingency plans and systems, maintenance schedules and costs, permit maintenance, source of O&M funding and duration of anticipated activities must all be detailed and analyzed. It is nonsensical to propose leaving a complicated system that no one will be qualified or funded to operate or maintain. Will TVX provide long-term funding?

#### Issue Discussion

The level of information required for informed impact assessment and permitting is not synonymous with final design. The applicant would be required to submit final design before any work could begin. This does not mean that the documents available are insufficient for permit decisions. Adequate information, including long-term monitoring data and water distribution system performance are available to determine the environmental consequences.

Two Crevice Adit pipelines would be constructed. One would be a 2-inch diameter high-density polyethylene (HDPE) pipeline. The other would be an 8-inch diameter HDPE pipeline. Both would be buried in the current Mineral Hill access road borrow ditch, bedded in granular material, and covered with at least 6 feet of soil cover resulting in a frost free installation. The entire system would be supplied by gravity flow. The 50,000-gallon storage tank would be replumbed for 100 percent gravity operation – both filling and discharge. A remote control valve would be installed to allow instantaneous fire flow.

The Crevice Adit would be secured by a concrete bulkhead and steel entry door. Access would be maintained underground 1,500 feet to the 8-inch pipeline inlet, and an additional 500 feet to the water supply well at the head of the 2-inch potable water line.

A conservative estimate has been prepared for the ongoing maintenance of the Crevice Adit water system. A discussion of the proposed closure bond is included in *Chapter 3*.

The existing surface pipeline would require long-term maintenance as well, and is subject to damage from landslide, tree fall, and snow creep.

The discharge to Bear Creek would be maintained for the long term. The Applicant's Proposed Plan would result in a reduction of MPDES Outfall 001+003 from less than 400 gpm to approximately 135-200 gpm. All of this discharge would be Crevice Adit water. The 1300 Adit would no longer discharge to Bear Creek.

The potable water system would be simple in design and construction. The artesian well would be refitted with stainless steel piping and the concrete sanitary seal would be expanded to cover all piping up to the shutoff valve. The shutoff valve would connect to the 2-inch HDPE pipeline, which would then be buried in the adit sill (floor). Under artesian and elevation head, the water would flow to and fill the 50,000-gallon insulated steel tank. A self-actuating valve would be controlled by a float switch in the tank to shut off inflow when the tank is full. This would conserve water. When the tank is full, a continuous flow from the 2-inch line would result in up to 50 gpm of additional high quality water being discharged to Bear Creek.

The potable/fire suppression water system would be entirely gravity fed. No pumping would be required. Two control systems would be required; one for opening and closing the fire pipeline valve at the 50,000-gallon tank and one for controlling the 2-inch inflow pipeline. Both control systems would be simple, reliable, common, and proven technology. Long-term maintenance costs have been calculated, and are shown



in the *Chapter 3* post-closure maintenance bond calculation.

*Carry forward as a significant issue:* The Crevice Adit Water System Design changes could impact water quality in many ways. This is a significant issue for comparison of alternatives, and it will be carried forward into *Chapter 3*.

#### Issue 4. 1300 Adit Drainage

##### Summary of Comments

Note: DEQ has paraphrased the comments received from the public below with a minimum of edits.

- What are the long-term maintenance implications and costs for this [Crevice and 1300 water systems] proposal?
- Would the proposed discharge to ground water meet applicable water quality standards?
- Would the underground workings be able to assimilate the increased inflow without overflowing out the 1300 Adit?
- Would the discharge to ground water impact Bear Creek in any way?
- How does this new proposal compare to the impacts resulting from the existing MPDES discharge to Bear Creek? Should the existing discharge to Bear Creek be maintained for the long term?
- *Appendix 2, MPDES Permits:* How will the MPDES permits be administered post-closure and who will hold the permits, assure permit compliance, report results and bear the costs?
- *Volume 1, Page 55:* The text states that "Additional studies are planned to test the hypothesis that such a ground water discharge will have no measurable effect on the hydrologic or Bear Creek surface water regime." This information is needed before a water management plan is approved. Note also the discussion below related to water rights and the provisions of the Reserved Water Rights Compact between the State of Montana and the National Park Service.
- *Volume 1, Applicant's Proposal, beginning on Page 57:* The text states that the specific long-term water management approaches proposed provide a mechanism to assure operation, maintenance and monitoring of the various waters that will require active management (the Crevice flow, the 1300 drainage, and the TSF seepage). The scoping document has identified several issues related to the adequacy of the design. We request that the environmental analysis include a risk analysis for potential failures many years into the future (if there are not already plans to do so). We also request that the adequacy of the bond be discussed.
- *Volume 1, Page 58, 1300 Level Drainage:* The text states that the specific water management approaches proposed for use, are "Subject to the findings of the ongoing hydraulic loading tests and tracer mixing tests". These findings are needed before a final design is approved and implemented.
- *1300 Adit:* This whole concept regarding 1200/1300/Crevice water including drill holes, discharge to ground water, hydrologic connectivity to Bear Creek, grandfathered water, MPDES permits, non-degradation, new or increased sources, 1050 water, mixing waters with different chemical finger prints, dilution, put the water back into the fractures and interstitial pores from whence it came is ludicrous. Where's the EPA and their regulations? The whole proposal is so hard to grasp you would think an attorney thought it up. Is this the Null Hypothesis? Because I am only a stupid engineer (I guess only a hydrologist could understand this), you need to show me the proof and make me understand it. Better yet, come up with an alternative/contingency plan.
- Wastewater discharge from the 1300 Portal, and potential wastewater discharge from the 1200 Portal: handling, treatment, disposal, monitoring and permitting: Specific, detailed monitoring and reporting plans, contingency plans and systems, maintenance schedules and costs and duration of anticipated activities must all be detailed and analyzed.
- The company's proposed plan to "disappear" 5-50 gallons per minute of wastewater from the 1300 Level into the fracture-system aquifer on the 1200 Level is absurd. The 1200 Level ramp is already flooded up to the water table by water that flowed out of the rock when the ramp was opened.
- Water quality issues have long been at the heart of BCC's concerns with mining in general and, since the development of substantial discharges from MHM, with this mine in particular. The CCP proposes to plug the Crevice Adit upstream from its connection with the works in Mineral Hill and assure that all internal drainage in Mineral Hill reports to the 1200 Level decline ramp where it is presumed that it will be discharged to ground water. On its face it is reasonable to conclude that

the addition of 20 gallons per minute of water to the 1200 Level pool will simply fill it up and eventually return as a discharge at the 1300 Adit. Furthermore there doesn't appear to be an explanation why the elevated nitrates and arsenic in the water would not eventually contaminate the ground water. Will the analysis resolve and justify these issues?

#### Issue Discussion

TVX has withdrawn plans to route water into the 1200 Level and has proposed another plan to route the 1300 Adit water to the existing septic tank and drainfields. The new 1300 Adit water management system utilizes gravity flow and the current mine workings. The 1300 Adit is the lowest draining Portal in the mine. All mine workings above and including the 1300 Level drain to the 1300 Adit.

TVX plans to bury a pipeline to a chemical addition building where ferric sulfate would be used to co-precipitate arsenic out of the 1300 Adit water. The water would then be routed in a buried pipeline to the existing septic tank. The discharge would eventually be discharge from the dosing tank to the two drainfields as a ground water discharge.

Monitoring data verify that the 1300 Adit drainage has declined to about 15 gpm (Figure 2-11, 1300 Adit Discharge Rate). The net effect is that Bear Creek water quality could improve as a result of the ground water discharge.

*Carry forward as a significant issue:* The 1300 Adit drainage system is complex and unproven. Therefore, it is a significant issue for comparison of alternatives in Chapter 3.

#### **Issue 5. Long-Term Monitoring and Maintenance**

##### Summary of Comments

Note: DEQ has paraphrased the comments received from the public below with a minimum of edits.

- *Volume 1, Page 59, Monitoring Plan:* The text states that "An extensive monitoring program will be designed to collect and test information needed to measure performance." We could only find limited references elsewhere in the CCP to quarterly water quality tests. We also found no discussion of monitoring of revegetation success and no discussion of the longevity, and therefore needed, monitoring of the water management infrastructure. The monitoring and response plan for remediation (if something goes wrong) is an important factor for the EA to address.
- *Volume 1, Page 60, Schedule:* The text optimistically states that some monitoring sites may be deleted within 1-3 years, while others may be needed for 5 years or more. Given the uncertainties of revegetation success in such harsh conditions and the unproved nature of the water treatment proposed, we believe that monitoring should be many more years than 5+ and that the bond be held for a similarly long period of time.
- TVX Gold's reclamation plan is flawed and incomplete. The plan, as represented at the public meeting, calls for long-term reliance on equipment and infrastructure that are subject to mechanical failure, with no provision for monitoring or maintenance. The plan calls for long-term reliance on unproven wastewater treatment technology (the same technology recently rejected by DEQ for implementation at the closed Kendall Mine?) with no provision for monitoring or maintenance. The plan calls for long-term wastewater discharge and disposal with no provision for monitoring or maintenance.
- *Post-closure monitoring:* Duration, scope, schedules, costs, accountability, contingencies and remediation measures must all be outlined in detail and analyzed in MEPA review. Carefully designed and rigorously implemented post-closure monitoring is the only means of assuring that reclamation goals are achieved and maintained over the long term. Monitoring should include, at a minimum, continuation of current surface and ground water monitoring, all water and wastewater systems and discharges, tailings cap performance and stability, Portal pad stability, Portal plug performance, revegetation success, status of all remaining infrastructure and wildlife habitat utilization. The duration of monitoring is a critical component of the plan, little discussed in either the original or the revised reclamation plan. This is another example of omission from the original and

revised reclamation plans, which militates for comprehensive review under MEPA.

- What applicable permits are needed during post closure?

#### Issue Discussion

A draft post-closure quality assurance project plan (QAPP) is included in the CCP as Appendix 10. It discusses hydrologic monitoring designed to test the hypotheses presented in the Applicant's Proposed Plan. These hypotheses would be tested and monitoring used to measure success/failure. A synopsis of the applicant's proposed long-term monitoring and maintenance measures is included in the CCP in Appendix 11.

Sufficient bond would be retained for the State to redo the reclamation until such time as inspection or other methods of providing decision making information – as specified in the QAPP – is available. Following a determination that the goals of the reclamation plan have been met, the reclamation will be determined to be successful and the bond would be released.

*Carry forward and treat as a significant issue:* Long-term maintenance and monitoring is a significant issue to consider in the comparison of alternatives. Therefore, this issue will be carried forward into Chapter 3.

### **Issue 6. Reclamation Schedule**

#### Summary of Comments

Note: DEQ has paraphrased the comments received from the public below with a minimum of edits.

- *Volume 1, Page 60, Schedule (and Figure 30):* The schedule for the 2000 and 2001 field seasons will include grading and capping the TSF, and salvage and removal of the mill area complex structures, respectively. This work should not be initiated until the numerous studies and tests identified in the CCP are completed, thereby not precluding alternative closure options.
- Does the schedule for removal of the mill structures (which presumably house the current RO water treatment system) include the dismantling of the water treatment system? If so what contingencies are there for treating water from the TSF prior to successful implementation of the proposed passive treatment system? Figure 30 shows work on the TSF being completed in the 4<sup>th</sup> quarter of 2000 and facilities removal beginning in the 2<sup>nd</sup> quarter of 2001. This does not allow any

time to treat seepage until the seepage rate "consistently falls to or below 1.0 gpm".

- *Volume 1, Page 60, Schedule:* With the proposed removal of the mill structures in 2001, where will staff be officed, and will there be a water quality lab on site.
- As you know, one of our concerns has been the time line for the closure plan. The community needs and deserves to know what we can expect in the way of activities on the site. Equally important is a thorough understanding of the environmental consequences of the sequencing of reclamation work. Will the draft provide us with a complete schedule and task summary with a discussion of the consequences of the alternatives?
- Operational contractors, in contrast to planning consultants, appear to have begun work on at least some elements of the closure work. What steps does the department plan to take to ensure that this work does not preempt decisions that should be made through the environmental review?

#### Issue Discussion

The studies referenced in the Applicant's Proposed Plan have been completed with the exception of final design. Adequate information is now available to make reasoned determinations of the relative impacts of the alternatives relative to capping the TSF. Facility salvage is not an issue being considered in this state action.

It is in the best interests of the State of Montana to see reclamation done on an expeditious schedule. The applicant is prepared and funded to implement the reclamation work. To delay the applicant beyond a reasonable time to conduct the necessary environmental review would be counterproductive and unsupportable by state statute and regulation. In fact, the Metal Mine Reclamation Act (82-4-341(4)(b)) requires completion of reclamation within 2 years of the cessation of mining operations. To delay the reclamation could lead to a violation of that requirement through state action.

Mine staff would be housed at such location as is determined by the applicant. TVX owns several suitable buildings in the Jardine town site that would serve office purposes. No on-site laboratory currently is in use and none is planned or considered in this EIS.

This EIS is being prepared to facilitate the State's decision regarding modification to the approved reclamation plan. Reclamation work that is approved under the Existing Plan can begin at any time. Regardless of whether the changes have less, greater, or the same environmental impact, those items that are

proposed to change in the CCP cannot proceed until the MEPA review is complete and state action has been taken.

DEQ reviews TVX plans to remove facilities when there is a chance that the removal may prevent the use of the facility in the post-closure water management systems. TVX is aware of the need to preserve the various portions of the mill complex that would be needed for water treatment contingency plans.

*Eliminate from detailed study due to minor or no effects:* The reclamation schedule would be equally as aggressive for either the Existing Plan or the Applicant's Proposed Plan. Modifications to the proposed reclamation schedule could be made in the Agency Modified Plan for each issue if needed. As a result, the reclamation schedule is not considered a significant issue for comparison of the alternatives, and it will not be carried forward into Chapter 3.

## Issue 7. Future Land Use

### Summary of Comments

Note: DEQ has paraphrased the comments received from the public below with a minimum of edits.

- The CCP would donate the private land to the USFS making it more difficult to mine in the future. This could impact the local economy if mining was desired sometime in the future.
- *Appendix 3D:* The text states: "through pre-negotiation conferences with entities and individuals interested in acquiring the land, TVX Mineral Hill, Inc. will gather data on the proposed post-mining uses to be made of the land by those entities and individuals, and on the desirability of maintaining improvements having continuing utility or historic significance." This suggests that some potentially important decisions (one example would be to keep the mill and converting it to a non-mining use) will be made post-environmental analysis. If so, we believe an amended EIS might be warranted. Given the short time frame for final decisions on closure, it would be better to include such possibilities in the forthcoming EIS.
- Speaking of the Forest Service, what about post-closure land use knowing that "closure" is a relative term? Does the USFS want all that liability? Is it legal for them to knowingly assume liability? At a minimum, the USFS would be required to conduct a CERCLA based audit (Transaction Screening Process). Then what? DEQ needs to address post-closure land use. It is one of the most controversial issues surrounding

closure. Maybe DEQ and USFS should jointly write the EIS.

- *Post-closure land ownership and land use:* MEPA analysis must include review of specific land use alternatives. Will the company subdivide and sell the property? Deed it to the U.S. Forest Service or to the State – with all the attendant long-term risk, responsibility and costs? What will become of residential buildings in Jardine? Will a conservation easement or other stipulations against subdivision and/or development be considered? If the property is deeded to the Gallatin National Forest, and future environmental problems arise, who will fund restorative and remedial work after the company's permits and bond have been retired? How would Montana hold the new landowner, the Federal Government, accountable for site-related problems that affect state resources? Would a transfer of ownership to the U.S. Forest Service require NEPA analysis?

### Issue Discussion

Under Operating Permit 00100, the applicant is obliged to protect historical structures and features in accordance with the Cultural Resources Impact Assessment and Management Plan (HRA, 1984). Should the applicant request a change in the management plan that is considered a substantive change in the operating permit, DEQ would determine the extent to which MEPA review is required. No actions relative to the historically significant structures and features in the Jardine Historic District are considered in this EIS. DEQ and the USFS have reviewed the closure of the historic structures to ensure no significant features would be affected that the USFS might use in the future if the property were to be donated to the public.

Transfer of the private land to the USFS is not an issue to be considered in the context of the Metal Mine Reclamation Act operating permit. It is not an associated action subject to DEQ review. The Operating Permit 00100 requirements are independent of the landowner. The applicant has not applied for a change in post mining land use. They have indicated that the property may be sold or transferred to others with the intention of retaining the post mining land use.

TVX and the USFS have revealed that they are in negotiations on the transfer of the property.

*Carry forward and treat as a significant issue:* The alternatives will be considered on how they affect the potential future use either by private parties for the approved post-mine land use or by the USFS for proposed land use plus education, historical

interpretation, etc. This issue is considered significant and will be carried forward into Chapter 3.

## Issue 8. Water Rights

### Summary of Comments

Note: DEQ has paraphrased the comments received from the public below with a minimum of edits.

- *Water Rights:* The water from the Crevice Adit flows into Bear Creek, which is a tributary stream to the reserved portion of the Yellowstone River, a Category 4 stream as defined in the Water Rights Compact between the State of Montana and the United States (Compact). Any use of water from this source would be subject to the terms and conditions of the Compact.

### Issue Discussion

TVX Mineral Hill, Inc. currently holds a water right to 50 gpm for beneficial use of Crevice Adit water. The proposal is to use up to 50 gpm for beneficial use and discharge from 135-200 gpm, a reduction of roughly 200 gpm from the current situation.

*Eliminate from detailed study due to minor or little effects:* This issue is not considered to be significant to the Chapter 3 analysis because no water rights would be changed.

## Issue 9. Revegetation

### Summary of Comments

Note: DEQ has paraphrased the comments received from the public below with a minimum of edits.

- *Volume 1, Revegetation Plan, starting on Page 42:* The text identifies species mixes for seeding and tree and shrub planting but does not discuss the standard for determining success. If the revegetation is not deemed successful, is there a contingency for returning to the site to do more work? How much vegetation is needed for the "water balance" TSF cap to perform as designed? Will wildlife and livestock be excluded from the revegetation sites until the sites are fully revegetated?
- We applaud the Mineral Hill Mines' proposal to utilize native species. We encourage them to delete the non-natives from the seed and planting mix for several reasons. As they noted, species native to the area have a much higher potential for reestablishment and long-term success under the harsh conditions. Some of the species listed in Tables 11 and 12 require more than the calculated

annual precipitation for Jardine of less than 18 inches per year. Meadow foxtail (*Alopecurus pratensis*) and Alsike clover (*Trifolium hybridum*) require 25-35 inches of moisture per year (according to the tables), would probably have to be maintained with irrigation, and are aggressive non-natives which can crowd out the natives. We have found *Trifolium hybridum* to be an aggressive colonizer that is a serious bear attractant – another reason not to plant it. Cicer milkvetch (*Astragalus cicer*) is an aggressive non-native not currently found in Yellowstone Park: We request that it not be used to lessen the chances for it to invade.

- Table 16, List of Alternative Shrubs for Revegetation of Development Rock Facilities, contains a number of species not naturally found in this area: *Penstemon venustus*, *Rubus leucodermis*, *Ceanothus sanguineus*, *Sambucus cerulea*, *Rhus glabra*, *Cercocarpus ledifolius*, and *Holodiscus discolor*. We would be happy to meet with MHM staff and consultants to suggest local native alternatives.
- *Volume 1, Page 45, Tree and Shrub Planting:* Will growth media be buried in the planting hole as illustrated in Figure 21?
- So far the public discussion of the revegetation elements of the reclamation plan has been marked by conditional, presumptive and prospective statements. On balance, native species seem better for the long run. What we have seen so far suggests that the applicant may have a fairly robust plan in terms of climatic variation but little that suggests serious attention to the impacts of possible short-term events that have, and are likely to continue to occur. Will the analysis resolve these questions?

- Topsoil deficit: If importing material, what and where? If importing, beware knapweed. Making soil?
- The Closure Plan mentions a "construction borrow source." What and where?

### Issue Discussion

The applicant has proposed vegetation success would be based on ground cover according to the construction storm water permit. The ultimate performance of the water balance cap would be dependent on the resulting measured seepage rate.

Fences were removed during regrading and no attempt is planned by the applicant to limit wildlife grazing.



Plant growth media where tree tubelings are to be planted would be mulched with rock or other means to retard grass establishment in the immediate area of the tubeling. This would give the tubeling a competitive advantage in getting established.

The water balance cover was modeled from the time of seeding through 200 years. Sensitivity analysis using the EDYS model was used to predict the effects of various stressor conditions including, wetter and drier climate, wildlife over grazing, fire, and possible erosion and rill formation.

Based on an accounting of available resources, soil is limited in the Existing Plan. It is estimated that 14,200 cubic yards (cy) of soil material would be required to complete the reclamation as proposed in the Applicant's Proposed Plan. Additional soil resources are required. The applicant has indicated soil would be "manufactured" using onsite alluvial borrow materials and imported soil and organic amendments. The availability and quality of soil is significant to the probability of successful reclamation and especially revegetation.

*Carry forward and treat as a significant issue:* Reduction of long-term TSF seepage rates is dependent on establishment of a mature Douglas fir stand. This issue is considered significant to the comparison of alternatives and it will be carried forward into the analysis of Chapter 3.

## **Issue 10. Noxious Weeds**

### Summary of Comments

Note: DEQ has paraphrased the comments received from the public below with a minimum of edits.

- *Volume 1, Page 52, Noxious Weed Control:* The text states that a noxious weed management program will be continued during revegetation activities. Does this mean until revegetation has met a quantified goal for success or just during seeding and planting?
- *Noxious weed infestation and control:* Specific, detailed monitoring and reporting plans, contingency plans, maintenance schedules and costs, accountabilities and the duration of anticipated activities must all be detailed and analyzed. Noxious weed invasion is one of the most pressing environmental problems in ecosystems throughout the American west. Little or no mention is made of this major environmental issue in either the original or the revised reclamation plans.

- TVX is reportedly importing or preparing to import topsoil onto the mine site. There are few, if any topsoil sources in Paradise Valley free of knapweed seed. Importing topsoil to MHM from within any affordable haul distance will, thus very likely introduce knapweed to a site that has been virtually weed free for many years.

### Issue Discussion

Noxious weed control is a requirement in Park County under the Montana County Noxious Weed Control Act. It is also required under Operating Permit 00100. The existing reclamation bond includes cost for 5 years of weed control. The landowner is required to control noxious weeds at all times. No action being contemplated in this EIS would affect the necessity to control noxious weeds on the MHM area. The applicant has implemented a noxious weed control program in the past and present, and proposes to continue this program into the future. Because of the legal requirement to maintain noxious weed control by the current or any future landowner, DEQ does not consider changes in land ownership an action that would significantly affect the environment.

Soil and organic matter amendment importation is a concern in spreading noxious weed seed. The Applicant's Proposed Plan has incorporated various measures designed to identify and treat soils and organic amendments that would be imported to the site. The risks associated with importation of these materials would be managed through these measures. Additional soil is needed. The weed control program is designed to limit the importation of weed seed and to control weeds from becoming established.

A test program has been proposed to identify noxious weed seed/germination in the imported materials, and an active weed identification and control program would be conducted in the field. Should the applicant decide to import other soil materials, the same test protocol would apply.

*Carry forward and treat as a significant issue:* Noxious weed control is an issue common to all alternatives under consideration. An adequate weed control program has been effectively implemented in the past, and the applicant proposes to add additional testing. Noxious weeds are a significant issue in that offsite materials are proposed to be imported. Therefore, it will be carried forward to Chapter 3.

## **Issue 11. Bond**

### Summary of Comments

Note: DEQ has paraphrased the comments received from the public below with a minimum of edits.

- *Volume 1, Applicant's Proposal, beginning on Page 57:* The text states that the specific long-term water management approaches proposed provide a mechanism to assure operation, maintenance and monitoring of the various waters that will require active management (the Crevice Adit flow, the 1300 Adit drainage, and the TSF seepage). The scoping document has identified several issues related to the adequacy of the design. We request that the environmental analysis include a risk analysis for potential failures many years into the future (if there are not already plans to do so). We also request that the adequacy of the bond be discussed.
- *Appendix 1, 1999 Mineral Hill Water Treatment Plant Operations and Maintenance Manual, Page 7:* The Manual refers to monitoring the liner leakage system at least weekly to maintain liner integrity. What are the plans for monitoring post-closure? On page 28, the text states that the monitoring plan shall include the continued investigation of the Old North Tailings facility. What are the plans for monitoring post-closure?
- *Appendix 4, Bond Release Worksheet:* The worksheet projects an annual operating cost for the TSF seepage passive treatment of \$720 and a Trust Fund Capitalization (eight percent, 100 years) of \$9,000. This miniscule amount is wholly inadequate in light of the potential costs of mitigation should the proposed TSF water management system fail. Given the "forever" nature of the tailings facility, the 100-year term might not be long enough.
- The closure proposals, as stated by TVX, bring up many serious questions regarding long-term liability. It seems TVX went out of their way to come up with proposals that will require a long-time presence at the site (monitoring and infrastructure). Is TVX prepared to honor its long-term financial obligations? Can they honor it? Maybe Normandy Gold should post the bond.
- In short, the reclamation bond amount for MHM must be re-examined immediately.
- Plans for the Jardine town site public drinking water and fire suppression water supply systems: Specific, detailed monitoring and reporting plans, contingency plans and systems, maintenance schedules and costs, permit maintenance, source of O&M funding and duration of anticipated activities must all be detailed and analyzed. It is nonsensical to propose leaving a complicated system that no

one will be qualified or funded to operate or maintain. Will TVX provide long-term funding?

- *Crevice Adit:* The water is good and should be used for beneficial purposes. This raises some questions about long-term bonding for initial construction of infrastructure (most Jardine residents live on the north side of Bear Creek), maintenance of the infrastructure, all the state and federal monitoring requirements, operator certification, and the ability to alter the system to accommodate changes in regulations.

#### Issue Discussion

A risk analysis of water system failure might be appropriate if the proposal was to construct a walk-away facility with no ongoing maintenance, but this is not the proposal. A low-maintenance system is proposed. Sufficient bonding and provision would be required to facilitate the long-term maintenance of the facility.

The liner leak detection system monitoring referred to in Appendix 1, page 7, is in regards to the SCP. The SCP has two liners and a leak detection system for water that might collect between the liners. The SCP would be reconstructed under the proposed closure plan into a passive biological treatment system and small surge pond for maintenance. Leak detection system monitoring would continue as part of the ongoing system operation. An allowance for this activity is included in the Applicant's Proposed Plan in Appendix 4 and in the discussion on bonding in *Chapter 3* in the EIS.

Monitoring in the old tailings north (OTN) is discussed in the Applicant's Proposed Plan in Appendix 10 (post-closure Quality Assurance Protection Plan). Two OTN wells would continue to be monitored during and post-closure on a quarterly basis.

The TSF seepage passive biological treatment system operating cost estimate would be analyzed. Operation of this system would be a minor component of a person's time. *Chapter 3* discusses the bond calculation regarding the latter issue.

The Crevice Adit fire suppression system would provide fire control water to two hydrants located within the company's property in Jardine. The proposal does not consider extending service to the residences on the north and west side of Bear Creek. However, the presence of the system as proposed does allow the opportunity for the community to propose extension of the system to serve other local service. This has not been a part of the Applicants Proposed Plan and therefore cannot be analyzed in this EIS.



Carry forward and treat as a significant issue: Bonding is an important and significant issue that will be carried forward in the comparison of Alternatives in Chapter 3.

## Issue 12. Old Tailings South

### Summary of Comments

Note: DEQ has paraphrased the comments received from the public below with a minimum of edits.

- *Volume 1, Page 10 (and also Page 31):* The text states that the old tailings south tailings will be reclaimed in place or relocated to the lined Tailings Storage Facility (TSF), depending on the outcome of the study and analysis plan. On page 17, Appendix 10, Draft Mineral Hill Mine Closure QAPP, Volume 2, it says that the test hypotheses will be confirmed or refuted by continued testing of site lysimeters, adjacent wells, and by observation of the closure reclamation success. These statements seem to contradict each other. If the plan is to "try it and see," a risk analysis is needed to determine the potential impacts if the "in place" reclamation fails. If the decision to reclaim "in place" or to relocate the tailings is to be made, as a result of the environmental analysis process, more information is needed.
- *Old Tailings South:* The only environmentally secure method for dealing with this material is to remove it and all contaminated subgrade material and haul it to the TSF. To do otherwise would be unnecessarily reckless and irresponsible. It should be noted that the Closure Plan states that the aspens on the north end of the OTS are "supported" by tailings. It is unclear what is meant by that statement. The aspens are not growing in the tailings. The tailings migrated to that spot because of wind/water action. These tailings should be removed.
- Will water infiltrating through the reclaimed OTS tails leach out contaminants that would cause ground water contamination?
- The discharge and proposed disposal appear, in any case, to be illegal. The plan calls for renewing on a key commitment of the original reclamation plan – full removal of historic tailings near Jardine to the engineered tailings impoundment.
- The omission of this component from both the original and the now-revised reclamation plans illustrates the need for comprehensive review, revision and redrafting of the entire reclamation plan.

- *Removal of the historic tailings from the "old tailings south" site:* The company's proposal is a red herring, a patently irresponsible, unsupportable and unconscionable back pedaling from the important long-standing commitment to redress historical environmental degradation. There is simply no in situ reclamation treatment for this site that provides mitigation and protection equivalent to removal of these tailings to the engineered tailings impoundment. The character and environmental impact of these unconfined historic tailings are amply documented in company files. It can only be imagined that the company will withdraw this proposed change when it has won concessions on other points. No analysis can credibly conclude that the proposed change is an acceptable alternative to the original reclamation plan provision. This proposed change should simply be rejected and discarded.

### Issue Discussion

TVX withdrew its plan to leave the tailings in place and removed the OTS per the Existing Plan in 2000. The contaminated soil below the OTS was sampled, level of contamination defined and the soil was removed to the TSF. A minimum of 12 inches of replacement soil was placed on the OTS area and it was seeded in October 2000.

The aspen grove on the north flank of the OTS and a stand of bitterroot on the side of the OTS were not removed at the request of the Bear Creek Council. Retention of these trees, understory shrubs and bitterroots was preferred by DEQ to removing them in order to remove the tailings. Aspen and woods rose are growing in or through the tailings, with no observable adverse effect.

*Dismiss as irrelevant:* The OTS was completely reclaimed per the Existing Plan in 2000 and is therefore no longer an issue to be analyzed in this EIS.

## Issue 13. Development (Waste) Rock Piles

### Summary of Comments

Note: DEQ has paraphrased the comments received from the public below with a minimum of edits.

- What is the potential for acid rock drainage and metals solubility from the waste rock piles?
- *Long-term slope stability of Portal pad dumps:* They are angle-of-repose dumps located on steep hillsides. Although the crests will be pulled back, is this enough?

- Does the proposed plan for plugging, grading, and revegetation result in more stable slopes than the Existing Plan?
- ARD issues are a concern. It was TVX themselves who decided ARD was a very big concern 3 years ago. Let them follow up on that sentiment to undertake more extensive ARD testing (long-range predictive studies, e.g., humidity cell testing) of all the dumps to ensure that they will not be a source of ARD.
- Acid rock drainage and metals mobility:* Thorough studies must be completed satisfactorily. Without reliable data, there is no basis for a reclamation proposal, and no basis for a proper judgment as to appropriate reclamation applications.

#### Issue Discussion

Development rock (i.e. waste rock) was tested extensively in 1999 and 2000 and is largely non-acid generating (AKI, 2000a). Small volumes of the ironstone and quartz vein rock types that contained the ore were deposited in the development rock piles. Within Mineral Hill, the contact between ironstone and quartz vein ore rock and the adjacent schist development rock is relatively sharp. That is, sulfide minerals are largely contained within the ore and do not "grade" out into the surrounding rock. Ore was transported to the mill for processing, while the development rock was piled on the surface. Because of the discrete differences in sulfide mineralogy of ore versus development rock, the development rock was proven to be non-acid generating.

Some potentially acid generating waste rock and/or tailings were detected in the upper 5 feet of the piles. However, a large portion of the sulfur, predicted to generate acid, is present as residual sulfur; that is, bound within minerals that are relatively resistant to weathering. More readily soluble carbonate minerals were observed in petrographic analysis and core logging. Paste pH has proven to be an effective field reconnaissance tool for identifying potentially acid generating material.

DEQ gave permission to TVX to reclaim the development rock piles in 2000 according to the Existing Plan. Following grading, paste pH was measured. If paste pH had been less than 5.5, other reclamation measures would have been needed.

*Eliminate due to minor or little effects:* Development rock piles were proven to be non-acid generating. As a result, some development rock pile reclamation was completed in 2000 and will continue per the Existing Plan and is not a significant issue to the comparison of

alternatives in *Chapter 3*. Therefore, rock pile reclamation will not be carried forward in the EIS.

#### **Issue 14. Soil, Borrow, and Organic Matter Sources**

##### Summary of Comments

Note: DEQ has paraphrased the comments received from the public below with a minimum of edits.

- Several comments were raised about soil, borrow materials and organic amendments that were proposed as part of the CCP (Issue 9-Revegetation).

##### Issue Discussion

The importation of materials is a significant issue and will be carried forward into the EIS in Issue 9-Revegetation.

#### **Issue 15. Roads**

##### Summary of Comments

Note: DEQ has paraphrased the comments received from the public below with a minimum of edits.

- Roads? The Gardiner Ranger District may have some thoughts.
- Roads on Mineral Hill.* When all final reclamation and closure work is completed, including post-closure monitoring, the roads accessing the mine portals, raise collars, historic works and exploration sites should be fully reclaimed and revegetated. This is one of many examples of an issue neither identified nor addressed in either version of the reclamation plan, and supports the argument for comprehensive review now within the framework of MEPA. The District Ranger raised this issue at a company-conducted meeting 16 months ago in Gardiner. The company's environmental vice president summarily dismissed the point. Unfortunately, the question was not raised at the March 15, 2000 DEQ meeting.

##### Issue Discussion

Operating Permit 00100, minor revision MR97-005, identified those roads and trails that are to be reclaimed and were approved as part of the Existing Plan. The Applicant's Proposed Plan does not seek to modify that requirement. The USFS may have some concerns about road closures if they take over the site. The USFS and TVX have been reviewing the post-mine closure of roads identified in the MR 97-005 and are largely in agreement on which roads are needed post closure.

*Eliminate from detailed study due to minor or little effect:* The post-closure road system has largely been agreed upon by DEQ and the USFS for this private land block. Therefore, this issue has minor consequences and will not be carried forward in this EIS.

#### Issue 16. Ground Water

##### Summary of Comments

Note: DEQ has paraphrased the comments received from the public below with a minimum of edits.

- *Contamination in ground water at monitoring well #10.* Impact to Bear Creek, mitigation plan, and monitoring/reporting plan and schedule must be detailed and analyzed.
- Trends in ground water quality have shown that certain areas on the Operating Permit 00100 area have shown declining water quality. Initial indications are that they are natural trends and not related to mining. However, monitoring and a contingency plan may be needed until this can be proven.
- The HDS may not adequately control ground water pollution from TSF seepage.
- The 1300 Adit discharge may not be adequately treated in the proposed septic tank drainfield to prevent ground water pollution.

##### Issue Discussion

The applicant's proposal discusses the ongoing enforcement action regarding ground water monitoring well HSMW-10 (MW-10). A plan has been submitted and approved by DEQ to address this issue and ground water quality in the well has stabilized but is still above water quality standards for nitrates. The reclamation plan bond for any alternative selected would include this monitoring and remediation costs if needed.

The declining quality in ground water in some areas of the permit area would have to be monitored until it is proven that the trend is natural and not caused by mining activity. The reclamation bond for any alternative selected would have to include this monitoring and potentially a contingency bond for remediation if needed. This final plan would be developed as part of an enforcement action if needed.

The TSF seepage treatment proposal through a biological treatment system and HDS needs to be tested and proven. A contingency bond for backup water treatment is needed.

The 1300 Adit discharge water management system and eventual disposal to the septic tank drainfield needs to be tested and proven. A backup bond is needed.

*Carry forward and treat as a significant issue:* The ground water quality issue is significant to the current analysis, and it will be carried forward into Chapter 3.

#### Issue 17. Other Mining District Disturbances

##### Summary of Comments

Note: DEQ has paraphrased the comments received from the public below with a minimum of edits.

- *These studies must include all potential sources of mining-related contamination within the entire mining district, and must not be restricted to the company's deeded holdings:* It would be irrational and irresponsible to exclude consideration of potential mining-related environmental impacts on the basis of ownership alone. The mining district has long been controlled by the company/operator, and has always been integral to the company's property position, asset base and mining interests.
- *Historic Mine Openings:* I would suggest that TVX meet with the Abandoned Mine folks to discuss the possibility of mitigating/reclaiming old works at Upper Crevice/1<sup>st</sup> Chance (mine openings, shafts, tailings and dumps that support no vegetation). They do not own the ground, but they have controlled it and are in a position to do something. It would be the right thing to do.
- *Reclamation of all mine workings and mining-related disturbances within the mining district, whether on the operator/owner's deeded property or otherwise:* All mine openings, waste rock dumps, mill sites and tailings ponds should be inventoried, and plans provided for their mitigation, restoration, and monitoring. Rationale is also provided in the original plan for the removal/reclamation of historic mining disturbances that constitute a safety or environmental hazard. Such hazards are clearly not less a threat because they are on lands not owned by, but long controlled by the company for its benefit.

##### Issue Discussion

Operating Permit 00100 covers the area within the permit boundary (Figure 1-2). Areas covered under Exploration License 00559 are limited to the First Chance Portal and Crevice Adit areas. It is the operating permit area that the Mineral Hill Mine Consolidated Closure Plan is applicable to. This EIS

considers only those changes to the approved reclamation plan within the operating permit boundary.

*Dismiss as outside or beyond the scope of the project:* MMRA does not cover historic disturbances that were not disturbed by TVX even if they own them or control them. TVX has agreed to reclaim some of the historic openings and DEQ and the USFS have reviewed the proposed closure plans, even though this is not a regulated activity. This issue will not be carried forward in the EIS. A bond for proof of revegetation of the First Chance Portal and reclamation of the Crevice Adit will be included in the Operating Permit 00100 bond as part of this EIS.

#### Issue 18. Wildlife-Bats

##### Summary of Comments

Note: DEQ has paraphrased the comments received from the public below with a minimum of edits.

- *Bald eagle nest closure:* Company property is included within the closure zone for the northernmost of two Bear Creek bald eagle nest sites. A memorandum of understanding between the company and the Gallatin National Forest (Gardiner Ranger District) stipulates allowable and proscribed activities within the closure zone. Although I believe the 5-year post-abandonment period has expired on this nest sites, the issue should be reviewed in the MEPA process. This issue is mentioned in neither the original nor the revised reclamation plans. (Note: for whatever the value it may be to the department, that a confirmed grizzly bear den was located at the base of the downstream, southernmost, eagle nest tree).
- We looked at introducing bats to the area. TVX should also look into this possibility as it would be the right thing to do.
- *Bats and bat habitat:* Historic mine workings can provide suitable habitat for many species of bats. This issue, ignored in both the original and revised versions of the reclamation plan, should be included in MEPA analysis. This point provides another of many examples of an issue not mentioned in either the original or in the now-revised plans. Importantly, it also provides support for my contention that no further reclamation work should be allowed at MHM until all work can be done within the context of a comprehensive, current, publicly reviewed and fully approved reclamation and closure plan.

##### Issue Discussion

Reclamation of the disturbed land would improve the use of the site for threatened and endangered (T&E) species. The eagle nesting site and grizzly bear den will not be disturbed. Revegetation of the disturbed lands would improve the use of the site for grazing animals and increase the potential use by grey wolves and grizzly bears. Continued operation of the site was a potential detriment to T&E species. DEQ considers reclamation of the site under any closure plan as a benefit to these wildlife species and therefore the issue will not be carried forward in the EIS.

Bat habitat that may be existing in abandoned historic mine workings is an additional reason to retain historic mining features to the extent practical. There are multiple issues, which must be considered when deciding on the appropriate action to take regarding the proposed reclamation plan modifications. One important issue is public safety. The applicant has proposed to seal 12 historic mine portals and glory holes that constitute safety hazards. DEQ concurs that the general public is at risk of personal injury at the sites proposed for sealing. Potential bat habitat can be preserved while providing public safety as well.

*Carry forward and treat as a significant issue:* Closure of all adits should be reviewed for public safety as well preserving potential bat habitat. This issue is considered significant in the comparison of alternatives in Chapter 3.

#### Issue 19. First Chance Portal

##### Summary of Comments

Note: DEQ has paraphrased the comments received from the public below with a minimum of edits.

- *Wastewater discharging from the First Chance Portal: handling, treatment, disposal, monitoring, and permitting.* Specific, detailed monitoring and reporting plans, contingency plans and systems, maintenance schedules and costs and duration of anticipated activities must all be detailed and analyzed.
- This source has exhibited high arsenic values over the years, and flows for much or all of the year.
- Water discharge from the First Chance Portal or Crevice.

##### Issue Discussion

The First Chance Portal reclamation is permitted through Exploration License 00559. Water has been observed to emit from the Portal cut and the operator has submitted water quality information. Although there is some arsenic in the water there is no

demonstration that this water reaches a water of the United States or is directly connected to a water of the United States. No MPDES permit has been issued for this water.

The approved reclamation plan called for sealing the Portal and backfilling the Portal cut. DEQ reviewed the proposed closure plan and modified it at the request of the landowner. The landowner wanted post-closure access to the underground workings. The revised closure plan approved by DEQ included a bat grate to allow potential future use by bats as well. The plan was reviewed under MEPA and the site was reclaimed by TVX in 2000.

*Dismiss as irrelevant:* The First Chance Portal was reclaimed under Exploration License 00559 in 2000 and is outside the scope of this EIS. DEQ addressed water quality, public safety and bat habitat issues in a revised closure plan. A bond for proof of revegetation will be added to the Operating Permit 00100 for the First Chance Portal.

## Issue 20. Mineral Hill

### Summary of Comments

Note: DEQ has paraphrased the comments received from the public below with a minimum of edits.

- *Mine Subsidence:* Significant occurrences of subsidence are known, though perhaps not reported, on Mineral Hill and elsewhere throughout the mining district. All surface subsidence on mined lands within the district must be analyzed in the MEPA process, and appropriate mitigation and reclamation prescribed. Plans for identification, monitoring and mitigation/restoration of subsidence throughout the district must be detailed and analyzed.
- Mitigation of subsidence of all mine workings.
- Reclamation of the top of Mineral Hill? Been done?
- Regrading and reclaiming the top of Mineral Hill is contained within both alternatives.
- Subsidence concerns are limited to collapse subsidence. The applicant's proposal includes backfill of shallow stopes to preclude collapse subsidence. A summary report has been submitted to DEQ describing the backfill work that has been accomplished as part of the mining operation. There is no change in the reclamation plan

associated with subsidence under consideration in this EA.

- *Disturbed area on the top of Mineral Hill:* This disturbed area of several acres was not included in the original reclamation plan, nor was it mentioned either in the scoping document or at the public meeting. This area must be fully reclaimed: regraded, topsoiled, and revegetated. The potential for subsidence, should be carefully studied when planning reclamation of this hilltop site (SAFETY RED FLAG!). Note also that an area of wetlands was previously identified adjacent to the disturbed site.

### Issue Discussion

The disturbances were permitted after a non-compliance under Exploration License 00559. Collapse subsidence presents a safety concern, potentially increases potential water infiltrating into mine workings that needs treatment, and produces a small but potentially irretrievable loss of wildlife habitat. The applicant has submitted summary plans for the backfill of shallow stopes and drifts in Mineral Hill, including the portals, to control collapse subsidence. Much of this work has been completed under the approved mine operating permit or exploration license. The applicant has submitted a reclamation close-out report describing the areas backfilled.

The entire area was regraded to a mounded configuration limiting potential infiltration into the underground workings. Then the area was soiled and revegetated after DEQ and approval in the summer of 2000.

Wetlands were mentioned as a potential issue in this area. The wetlands were not disturbed by the reclamation activities.

*Eliminate from detailed study due to minor or little effects:* The area was evaluated for ARD potential and approved for reclamation in 2000. As a result, the issue will not be carried forward in the EIS.

**APPENDIX B**

**PRODGERS  
REPORT ON REVEGETATION**

**AT**

**TVX MINERAL HILL MINE**





## TVX MINERAL HILL MINE

Amerikanuak, Inc.

### BACKGROUND

Bighorn Environmental Sciences was asked to evaluate the need to organically amend reclamation coversoils at the Jardine Mineral Hill Mine. This is a rush evaluation: the seed has been bought, the client is anxious to put it in the ground, and the rubber rabbitbrush, sagebrush, and Douglas-fir seedlings arrive in a few days.

The 450 reclamation, an old mine adit, comprises the bulk of forest revegetation. The rest is old roads or small ancillary areas. The 450 area covers about 2.6 acres of a west-facing slope of 35%, a little steeper toward the bottom. The coversoil material was cast downhill during the original audit construction, and recently pushed back uphill.

Organic matter plays so many roles in soil ecology that it is impossible to say which ones are most important. At the Zortman-Landusky complex of sites, the organic content of the coversoil was related to both pine growth and total plant cover. It is a surrogate for long-term fertility in that the organic fraction is a reservoir of immobilized nutrients. It is the carbon-rich substrate for soil microbes that continuously mineralize a fraction of the organic matter and fresh plant litter to make inorganic nutrients available for vascular plants. These microbes play additional roles in vascular plant health. Organic matter also contributes to the physical quality of the soil, including soil structure (again, via soil microbes). An organic amendment probably will ameliorate the soil crust problem too.

Two lodgepole reference soils at another hardrock reclamation site (Zortman, there were no Douglas fir reference soils) contained 3-4% organic matter, compared to 2.3% in the 450 coversoil. So the coversoil is, on average, a little deficient but not bad. The values that make up the average, unfortunately, are quite variable: three of five sample locations were very low in organic content (Table 1). But if Douglas fir is actually the desired type of revegetation, using an organic amendment may do more to promote some of the 440 herb seeds being applied per square foot than conifers. For conifers, uncompacted soil or a fractured substrate (if lithic or paralithic material is near the surface) are the most important factors. During the establishment phase, plant competition from grasses and forbs can dramatically limit conifer seedling establishment.

This pretty well rules out the use of a nitrogen-rich organic amendment such as moderately aged horse manure, which is present at the mine. A wood-based amendment such as sawdust, shavings, or wood chips would be better, also acting in the short term as a nutrient impoverishment agent (favors trees over herbs) and promoting a fungal soil foodweb, which is better for trees.

## OVERCOMING THE ORGANIC MATTER AND FUNGI DEFICITS

The coversoil at the 450 appears heterogeneous, and the data confirm this. The best material, in the upper central area, obviously has a lot of organic matter (the data show around 5%). The worst material, just north of it, appears to be in-situ subsoil material. Its organic content is slightly less than 1%. Important soil data are summarized in Table 1. I believe that all samples were taken near the surface. As important as any of these is the percentage of coarse fragments (>2mm). While not measured, the coarse fragment content appears to be around 50%. Upon drying, the soil forms a crust tough enough to inhibit seedling establishment from seed (personal observation).

Table 1. Soil Characteristics of the 450 Area, based upon Five Discrete Samples

Sample No.	Organic Matter %	NO <sub>3</sub> - -----ppm-----	Olsen P -----ppm-----	Plant-avail K	Approximate Texture*	pH s.u.
1	5.5	17	12	275	SL	6.1
2	0.9	7	4	150	SiL	6.0
3	0.9	6	4	135	SiL	5.7
4	3.4	6	10	205	SL	6.2
5	0.8	7	4	140	CL (?)	4.9
	---	---	---	---	---	---
Avg.	2.3	9	7	180	good SL	5.8

\* Not actually measured. Stukenholz Labs infers texture from cation exchange capacity (CEC). Since CEC is overwhelmingly determined by the clay fraction or clay + organic matter, texture estimates are approximate.

Average soil fertility is not bad, but again it is not the averages but the extremes that matter most. Plant-available target concentrations might be 20 ppm N, 15 ppm P, and 200-250 ppm K for good forb cover. I recommend adding ten pounds of N, 25 pounds of available P, and 50 pounds of available K. That would be, for example, 22 pounds of urea, about 55 pounds of P<sub>2</sub>O<sub>5</sub>, and 60 pounds of K<sub>2</sub>O. The N will be quickly immobilized.

Conifers require access to a large volume of soil, but not particularly fertile soil. Lower levels of N and K would be acceptable for conifer revegetation. With known mycorrhizal fungi present, P fertilization wouldn't be needed.

The average organic matter content of the coversoil is sufficient for decent plant growth if adequate decomposer populations are present. Unfortunately, the average organic matter content is based on two very good values and three low values. From this standpoint alone, an organic amendment would promote better revegetation in portions of the unit.

Disturbed soils tend to become bacteria-dominated, often to an extreme degree. More mature soils have a fungal dominance, and coniferous soils have a pronounced fungal dominance. Amending with manure would further promote bacteria rather than fungi, moving the system the wrong way. Wood waste would move the system toward fungal dominance and also tie up nutrients, which will limit the success of some weeds, including Canada thistle. Canada thistle is probably the worst weed at the 450 site, but not necessarily at the tailings area to be reclaimed later.

A single sample of 450 soil had about 7 units of bacterial biomass to 1 of fungi. This extreme bacterial dominance is characteristic of very early succession -- basically weeds. For grasslands, a ration of 0.5-1 unit of fungi to 1 unit of bacteria is typical. For a forest soil, it's 2:1 with fungi predominating on past 10:1 for wet, old growth forests. The 450 coversoil actually has the same ratio of bacteria to fungi as the horse manure. Horse manure would add organic matter but do nothing to improve the microflora.

The 450 coversoil is low on protozoa, the most primitive single-celled animals that feed on the microflora primarily, but sometimes directly on dead organic matter. Amending with manure would speed nutrient cycling, but with a strong bacterial dominance this would favor weedy vascular plant species.

Clearly the coversoil could use an organic amendment and something to promote fungal populations. For Douglas firs, fertility is a secondary concern. A wood-based compost would be best for a wide variety of indigenous species, none more so than Douglas fir.

Unfortunately, options are limited for three reasons: availability/cost, need for weed-free amendment, and logistics. A good compost product costs around \$14/cy, but transportation costs are high, partly because compost is fairly light (e.g., 600 pounds/cy, depending on moisture content), so a truckload doesn't amount to much unless it's a special type of truck. The nearest compost supplier is in Butte. The wood waste available at Livingston may be contaminated with knapweed seed. I cannot recommend any amendment that brings with it a substantial risk of introducing noxious weeds at the time of seeding.

The second problem is application on the 35-40% slope. Something like a manure spreader would have to be self-propelled to prevent it from skidding downhill while being dragged across the slope. The final complication is that seeding and transplanting are scheduled almost immediately.

The best solution Amerikanuak Inc. found was a combination of wood waste, BioLogic Compost, and bovine manure. The product came from Belgrade and was applied at approximately 100 cy/A. For more details, call Ron Burke. With Canada thistle as the primary potential weed and Douglas fir as the most desired plant species, I would skip the manure.

Rethinking Revegetation at Mineral Hill

I understand that a number of parties are involved in reclamation at the Mineral Hill Mine and probably they don't want more opinions, but I believe that there is a potential to do a better job with less.

The seed mix titled "Douglas Fir" calls for 51 pounds of seed per acre, which translates to around 406 grass seeds and 34+ forb seeds per square foot. The strategy of seeding 440 seeds per square foot where, presumably, one wants to grow Douglas firs is not immediately obvious. To establish Douglas fir from seed, a raw, mineral substrate is prerequisite. Actually, foresters use this term to distinguish mineral substrates from the thick duff layer (distinguishable plant litter) usually found under coniferous forests. An uncompacted mineral soil with decent amount of organic matter is perfect for Douglas fir, as long as its not already occupied by competitive plants.

The extreme seeding rates, compared to the ten pounds or so I usually recommend (and that is often twice what is needed), set the stage for fierce competition both within and between species. Before seeing any revegetation on Mineral Hill, I told Amerikanuak Inc. that the seed mix was far too heavy with too much of the strong-establishing species such as slender wheatgrass. Revegetated plant communities near the 450 unit are slender wheatgrass-Alsike clover with little else. The same thing could have been achieved with about 3-4 pounds of slender wheatgrass seed and 1.5 pounds of Alsike clover. That would make money available for a good organic amendment or mycorrhizal inoculant, where needed.

Current seed mixes are not based on an understanding of plant establishment dynamics. There are conflicts within the mix and between seeded and transplanted species. There are lots of tiny DF seedlings in revegetation near 450, but whether they will survive is unknown. Likewise, rubber rabbitbrush is an early seral species, a colonizer, not a species whose seedlings out-compete existing competition. And sagebrush has long been known to require special measures to limit competition during the establishment phase and arbuscular mycorrhizae for best establishment and persistence.

Before going into a little detail, let me say that the objectives of revegetation are not clear to me. Short-term erosion control is always a concern, and permanence is a common objective. If restoration to a previous state is an objective at the 450 area, that would be Douglas fir forest. In that case, you merely augment the natural process. A three-acre opening in the forest would love to seed in with trees if we let it. If grizzly bear food is an objective, clover is a good choice. If you want to stifle natural succession, heavy seeding of largely introduced species is the route.

Whatever the objectives, the key to successful revegetation is to make sure all the fundamentals are in place: no major physical, chemical, or biological limitations in the coversoil, a good, weed-free seedbed, and a seed mix in which each species plays a role applied at a rate appropriate for the species and its associates. It takes a lot of knowledge to create an integrated revegetation plan. The objective of the Douglas fir seeding should be to augment a natural process, i.e., natural regeneration. Douglas fir seed will rain onto the site. Whether it will find a home depends on what already occupies the site -- which largely is a function of what Amerikanuak, Inc. seeds. Similarly, the grassland revegetation. The notion of seeding 50 or 60

pounds of seed including strong-establishing, competitive species and simultaneously planting tree or shrub seedlings indicates a lack of integration of the elements of revegetation.

Without going into detail, I suggest that natural Douglas fir regeneration be augmented by light seeding of not-very-competitive species, which should be broadcast into a very rough seedbed that provides lots of microtopographic relief and physically prevents erosion. I am attaching one I just recommended at another mine purely as an example. I would like to know more about the typical understory at Mineral Hill before prescribing forbs, but seed of forest forbs is hard to find and expensive anyway. In the interest of promoting diversity and augmenting natural processes, the revegetation plan should be re-evaluated, the elements integrated. With the possible exception of a legume, remove the introduced species as they are unnecessary up on the hill. The legume should be freshly inoculated, which hasn't been past practice.

Cut the rate. Let natural process dominate revegetation, at least on the hill. The savings in seed costs could provide more benefits if spent on enhancing coversoil characteristics. If you want plant succession to eventually mask the mine's surface impacts, augment it rather than block it.

To test this notion on a limited basis, given the fact that the seed mix has already been purchased, I suggest broadcasting 1/6 the drill seed rate be broadcast at a small load-off area on the way to the 450 unit. See how that developed compared to the very heavily seeded areas. Actually, old roads need not be seeded at all, just ripped. Natural regeneration will soon dominate. As for weeds, they will disappear if conifers are successful in reclaiming the site.

Rich Prodgers/Bighorn Environmental Sciences/9-19-00

Attached: noncompetitive seed mix to promote conifer regeneration; reference soil microbiology from Zortman.

## Grass-Forb Mix for Natural Tree Revegetation

We need some erosion control in areas where we want trees to volunteer, but not much competition. Volunteer Douglas fir regeneration will occur in the whole 450 area, and more so on old roads. The seed rate is for drill seeding. You could increase it by about 50% for broadcast seeding.

I suggest letting the trees volunteer. That way you have adapted local genotypes. If you decide to plant Douglas firs, be sure they're ectomycorrhizal inoculated. I wouldn't plant any shrubs within the forest.

ROLE/SPECIES	VARIETY	COST	RATE PLS Drill Seeding	
Nitrogen Fixation				(pounds)
Sainfoin	Eski	1.80	1	
Black Medic Clover		5.20	1	
Short-Term Erosion Control				
Slender Wheatgrass	Pryor	1.40	1	
Canada wild rye		4.25	1	
Enduring Grasses				
Bluebunch Wheatgrass	Goldar	9.10	2	
Bluebunch Wheatgrass	Whitmar	9.10	1	
Additional Forbs & Shrubs				
<i>Artemisia campestris</i> (hard to find)		?	0.25	
Cudweed sagewort ( <i>A. ludoviciana</i> )		54.60	0.25	
Rubber Rabbitbrush		78.00	0.5	
Possibly some other				
TOTAL			8 lbs./acre	

### Justification:

Nitrogen fixation remains desirable, but inoculated legumes attract grazers, which will eat trees. Also, I'm not sure whether attracting bears is desirable. Clover will do it, as will some grasses such as orchardgrass for at least a half-dozen years. Sainfoin will not persist, and black medic (an annual) is relatively inconspicuous and won't persist long within the forest. Slender wheatgrass will provide early grass cover but not persist. Canada wild rye is expected to do the same but be less competitive in the first year. Bluebunch wheatgrass is rather slow to establish and not very competitive -- a perfect choice for areas where we want trees to volunteer. The forbs and shrubs are seral species and not very competitive or attractive to wildlife. Along with bluebunch wheatgrass, they can play long-term roles in achieving our goals (executive summary), especially if trees don't establish as soon as hoped.

450 coversoil bacterial and fungal biomass compared to some coversoils and reference soil at the Zortman-Landusky mines.

Table 4. Comparison of Organic Matter (OM) Content and Bacteria and Fungi Biomass in Reference and Coversoils.

	OM %	Bacteria ug/g	Fungi ug/g	Ratio Fungi/Bacteria
A Landusky Coversoil Stockpile	1.0	141	38	0.27
A Landusky Coversoil Stockpile Coversoil Stockpile	0.6	131	55	0.42
Seeded Roadcut, Landusky	NA	126	116	0.92
<b>450 Coversoil</b>	2.3	150	21	<b>0.14</b>
Best Mollisol Reference	16.7	208	293	1.43
Pine/Bluebunch Ref.		149 139	298 369	2.00 2.65
Poor Lodgepole Ref.	3.6	151	340	2.25
Good Lodgepole Ref.	4.2	137	555	4.05





**APPENDIX C**

**MPDES PUBLIC NOTICE,**

**MPDES PERMIT FACT SHEET AND**

**DRAFT MPDES PERMIT NO. MT-0030252**



## Public Notice

APPLICANT NAME: TVX Mineral Hill, Inc.  
APPLICANT ADDRESS: PO Box 92, Gardiner, MT 59030  
APPLICANT STATUS: Renewal  
FACILITY LOCATION: Jardine, Montana  
PERMIT NUMBER: MPDES No.: MT-0030252  
EXPIRATION DATE: Five years from the date of issuance  
RECEIVING WATERS: Bear Creek and Ground Water

This application is for the renewal of MPDES Permit No.: MT-0030252. The permit has been modified from the previous permit by eliminating the direct discharge of historic adit water to Bear Creek through Outfall 003. The amount of flow from the Crevice Adit has declined and the discharge to Bear Creek through Outfall 001 is anticipated to be approximately 200 gpm upon closure of the mine in the year 2002. The flow from the historic 1300 Adit has also declined from 50 gpm to approximately 15 gpm. This water will be treated to remove arsenic to background concentrations in the ground water. This wastewater will be discharged to ground water through newly designated Outfall 005A&B. Treated wastewater from the tailings storage facility will continue to be discharged through Outfall 002 until 2002.

Bear Creek is classified "B-1" by the Montana Surface Water Quality Standards. B-1 waters are suitable for drinking, culinary and food processing purposes, after conventional treatment; bathing, swimming and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply. Degradation, which would impact established beneficial uses, will not be allowed. Effluent limitations will ensure that the Montana Nondegradation Rules, Montana Surface Water Quality Standards and National Secondary Treatment Standards will be met. Effluent load limits in this permit have been specified to support and define the total maximum daily loads (TMDLs) for Bear Creek.

Bear Creek in the area of the discharge is listed on Montana's 303(d) list and is given a low priority for TMDL development. The probable cause for impairment is flow alteration and other habitat alterations. The probable cause of impairment is listed as habitat alteration and the probable source is listed as mill tailings and placer mining. The drainage basin is identified as 43BM and the waterbody number is No. MT-43B002-2.

On September 21, 2000, a U.S. District Judge issued an order stating that until all necessary total maximum daily loads (TMDLs) under Section 303(d) of the Clean Water Act are established for a particular water quality limited segment (WQLS), the State is not to issue any new permits or increase permitted discharges under the MPDES program. The order was issued in the lawsuit Friends of the Wild Swan v. U.S. EPA. et al., CV 97-35-M-DWM, District of Montana, Missoula

Division. The DEQ finds that the renewal and re-issuance of this permit does not conflict with the order, because: (1) it is not a new permit; and (2) it does not allow any increase in the level of pollutants in the discharge covered by the existing permit; and (3) it does not allow a discharge of those parameters by which the stream is impaired.

The Environmental Management Bureau of the Department of Environmental Quality has prepared a Draft Environmental Impact Statement (EIS) on the final reclamation plan and closure of the TVX Mineral Hill Mine. The MPDES permit and Fact Sheet have been incorporated into the EIS as appendices.

The proposed permit requires monthly and quarterly self-monitoring of discharge quality and quantity, with the reporting of results quarterly. This permit and Statement of Basis will be submitted to EPA for approval of the TMDL under Section 303(d) of the Clean Water Act. The recommended expiration date for the permit is five years after the date of issuance.

02-08-01

FACT SHEET

for Proposed Permit Limits (Permit Renewal)

PERMITTEE: TVX Mineral Hill, Inc.  
PO Box 92  
Gardiner MT 59030

CONTACT: Frank Bergstrom  
Amerikanuak, Inc.  
President  
(406) 848-7421

PERMIT NO.: MPDES Permit No.: MT-0030252

RECEIVING WATERS: Bear Creek and Ground Water

A. Status of Permit

MPDES Permit No.: MT-0030252 was issued to TVX Mineral Hill Inc. (TVX) on April 1, 1996 and will expire on March 31, 2002. TVX applied for a modification of the permit on November 29, 2000 to reflect the current reclamation and closure of the mine site. Final closure of the site is anticipated in the year 2002. This modified permit shall remain in effect for five years at which time it shall be renewed if a discharge still exists. If the property is transferred to a new owner that entity shall also be responsible for the discharge under this permit.

B. Description of Discharge and Discharging Facility

The TVX Mineral Hill Mine was an underground precious metal mine located in the historic Jardine/Crevasse mining district. TVX obtained Montana Hard Rock Mining Operating Permit No. 00100 in 1984. The permit allowed underground mining, cyanide vat leach ore processing, dry tailings, and waste rock disposal under Montana's Metal Mine Reclamation Act. TVX obtained MPDES Permit No. MT-0030252 in April of 1996 for the discharge, at Outfall 001, of untreated ground water from pilot holes in advance of Crevice Adit drive. The MPDES permit was modified on April 18, 1997 to allow for the discharge of treated wastewater (Outfall 002) as well as water from the historic 1300 Adit which had been impacted by recent mine development (Outfall 003). The permit was modified again on June 27, 1997 to allow the discharge from ground water seeps impacted by mining (Outfall 004). The last modification on October 18, 1999 allowed the elimination of Outfall 004 because it was no longer discharging.

Active mining ceased in 1996 and for the past two years, the mine has been in a reclamation mode. Final reclamation and closure is anticipated in the year 2002. Approximately 2 gpm of process wastewater from the tailing storage facility continues to be treated and discharged through Outfall 002. Future process water generated by the draining of the tailings storage facility will be treated in non-discharging facilities. The unaltered Crevice Adit water has declined in volume due to draw down of the ground water table and the grouting of under ground drill holes. This process will continue in the future and it is anticipated that a maximum of 200 gpm will be discharged to Bear Creek. Up to 50 gpm of Crevice Adit water will be diverted to a water tank used for potable water and fire control by the town of Jardine. Jardine has an active public water supply system PWS ID No. 02898. The overflow from this tank will be discharged through Outfall 001 to Bear Creek. The mixing zone extends from the point of discharge 100 feet downstream. This is approximately 10 stream widths, which is the definition of a standard mixing zone [ARM 17.30.516(4)].

Water discharging from the historic 1300 Adit has also decreased in volume from approximately 50 gpm to 15 gpm. This water will be collected and treated by chemical coprecipitation, settling, and discharge in two existing drainfields (see application material for detail). Settling will take place in an existing 5,000-gallon septic tank followed by an additional 5,000-gallon dosing tank. Compliance samples shall be collected prior to discharge to the septic system. The drainfields were constructed in 1989 and 1996 and were designed to serve a population of 200. Because this discharge is to a new location the original Outfall 003 for this discharge has been eliminated. The new discharge location to ground water shall be designated Outfall 005. For monitoring purposes Outfall 005 has been further broken out as Outfall 005A sampled monthly prior to discharge to the septic system and Outfall 005B sampled once per year, in June, prior to the discharge to the drainfield. Because the limit for arsenic has been set at the existing background condition no mixing zone is required for this outfall.

The original discharge from the treatment system, Outfall 002, is still in effect. Originally water from storage ponds and the tailings facility were discharged through Outfall 002 at a maximum volume of 50 gpm. The limits in the original permit were calculated for a discharge volume of 50 ppm at the 7Q10 (see modified Statement of Basis, April 1977). Today only water seeping from the tailings storage facility is treated through the RO unit and discharged. The original outfall allowed higher limits during higher flows. This renewal has eliminated those limits. The mixing zone extends from the point of discharge in Bear Creek 100 feet downstream. This is approximately 10 stream widths, which is the definition of a standard mixing zone [ARM 17.30.516(4)]. It is anticipated that the treatment system and discharge will be eliminated by 2002.

C. Nondegradation

The Crevice Adit was permitted under an exploration license pursuant to the Montana Metal Mine Reclamation Act in 1994. Water was encountered in 1995 and a discharge permit was issued in April of 1996. Under the Water Quality Act in effect in 1995, discharges from



exploration activities were considered nonsignificant and the nondegradation rules adopted on April 29, 1993 did not apply [75-317(2)(p) MCA].

The discharge to Outfall 005 was originally permitted in 1996 as Outfall 003. This discharge is from the historic 1300 Adit, which was in existence prior to the adoption of the nondegradation rules on April 29, 1993. The 1993 nondegradation rules do not apply to discharges in existence prior to their adoption.

Outfall 002 was a new discharge in 1996 and was required to conform to the nondegradation limits and rules adopted in 1993. For a discussion of the nondegradation limits for Outfall 002, see the Statement of Basis dated December 1995.

A significance determination under the nondegradation rules adopted in 1993 [ARM 17.30.701 et seq.] is not necessary in this permit renewal since there are no new or increased discharges.

D. Mixing Zones

Because of the turbulence in Bear Creek, the mixing zone was considered nearly instantaneous in the previous permit. This is probably true; however, turbulence alone does not justify instantaneous mixing. A standard mixing zone of 10 river widths, approximately 100 feet, is a more appropriate designation [ARM 17.30.516(4)].

The discharge to ground water, Outfall 005, does not require a ground water mixing zone because background concentrations are achieved prior to discharge [75-5-306 MCA].

E. Past Discharge Data

See Monthly Self-Monitoring Reports in file.

The original discharge from the Crevice Adit, Outfall 001, was estimated and water quality limits calculated at 1,300 gpm. After the completion of reclamation and adit rehabilitation the predicted discharge is 200 gpm. No violations have been reported since April 1, 1996 the date of the original permit issuance. In the past 2 years of weekly sampling, during which water flows have continued to decline and closure of the mine site has advanced, no concentrations above detection limits have been reported for lead or mercury. There was only one detection of copper and eleven detections of cadmium.

The discharge from the 1300 Adit, originally designated Outfall 003 has been redesignated Outfall 005. The original outfall was permitted to discharge 50 gpm. Due to reclamation and decreased flows, the new outfall is estimated to discharge 15 gpm. Arsenic concentrations have remained high in this discharge (0.5 to 0.6 mg/L). The last 10 months of data (10 samples) has detected no lead or mercury and only one detection of chromium.

F. Description of Receiving Water

Bear Creek in the area of the discharge is classified as "B-1" [ARM 17.30.611(1)]. Waters classified "B-1" are considered suitable for drinking, culinary, and food-processing purposes, after conventional treatment; bathing, swimming, and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl, and furbearers; and agricultural and industrial water supply [ARM 17.30.623(1)]. The drainage basin is identified as 43BM, the USGS Hydrologic Unit Number (HUC) is 10070001, and the Waterbody Number is No. MT-43B002-2.

Bear Creek is listed as impaired for aquatic life support and cold water fishery on the 1996 Montana List of Waterbodies in Need of Total Maximum Daily Load (TMDL) Development [Clean Water Act Section 303(d)]. The probable cause of impairment is listed as habitat alteration and the probable source is listed as mill tailings and placer mining. Bear Creek is given a low priority for TMDL development in the 303D list.

On September 21, 2000, a U.S. District Judge issued an order stating that until all necessary total maximum daily loads (TMDLs) under Section 303(d) of the Clean Water Act are established for a particular water quality limited segment (WQLS), the State is not to issue any new permits or increase permitted discharges under the MPDES program. The order was issued in the lawsuit Friends of the Wild Swan v. U.S. EPA, et al., CV 97-35-M-DWM, District of Montana, Missoula Division. This section of the Statement of Basis establishes justification for renewal of this permit under the September 21, 2000 order.

The Montana Water Quality Act authorizes the issuance of point source discharge permits on a listed water body pending completion of a TMDL provided that: 1) the discharge in compliance with the provisions of 75-5-303, MCA (Nondegradation Policy); 2) the discharge will not cause a decline in water quality for the parameters for which the water body is listed; and, 3) the minimum treatment requirements are met.

See Section C of this Fact Sheet for a discussion of the application of the Nondegradation Policy to the outfalls.

The stream in the area of the discharge is impaired by habitat alteration caused by mill tailings and placer mining. This permit does not allow a discharge of tailings or any habitat alteration.

This permit requires minimum treatment limits for TSS and all other parameters if they are more restrictive than water quality based limits.

G. Proposed Effluent Limits

1. Technology Based Effluent Limits

Discharges of mine drainage from active mines are subject to technology-based effluent limits for metals (cadmium, copper, lead, mercury and zinc), pH and TSS as defined in 40 CFR Part 440 – Ore Mining and Dressing Point Category Source Category, Subpart J – Copper, Lead, Zinc, Gold, Silver, and Molybdenum Ores Subcategory. The limits which applied in the original permit were the New Source Performance Standards (NSPS) [40 CFR 440.104(a)]. Water quality based limits for all parameters in all outfalls, except TSS and copper, were more stringent than the NSPS standards in the original permit. Copper only exceeded the technology-based limit at higher instream flows in Outfall 002. Higher instream flow limits have been eliminated in this permit renewal.

Inactive mines are not subject to technology based limits. If an analysis determines that water quality based effluent limits (WQBEL) for technology-based parameters have no reasonable potential to be exceeded the parameters will be eliminated in Outfall 001. No WQBEL were developed for TSS, therefore the technology-based limit will be maintained in Outfall 001. Since treatment is still being applied to Outfall 002 the original permit limits have been retained.

## 2. Water Quality Based Effluent Limits

The 7-day, 10-year (7Q10) low flow for Bear Creek was determined to be 6.0 cfs (2,690 gpm)(see permit application TVX Inc. 1996).

### Effluent Pollutant Limits - Basis for Calculations

Effluent limits for typical pollutants will be checked against state standards as listed in Circular WQB-7 (September 1999). The following equation will be used to determine the effluent limit.

$$C_2 = \frac{C_3(Q_1 + Q_2) - C_1 Q_1}{Q_2} \quad \text{Equation 1}$$

- $C_1$  = background concentration, mg/L
- $C_2$  = allowable discharge concentration, mg/L
- $C_3$  = instream concentration limit for pollutant (from Circular WQB-7 or other appropriate chronic standard)
- $Q_1$  = 7-day, 10-year, low-flow value for the receiving stream
- $Q_2$  = maximum flow of discharge (peak or average of highest flows over time)

For a parameter of concern, it is first necessary to determine if the maximum observed concentration has a reasonable potential to cause an exceedance of the standard. This is done by calculating the coefficient of variation (CV) which is equal to the standard deviation divided by the average of the data set. The coefficient of variation is then compared with the number of samples used to determine a Reasonable Potential Multiplying Factor (RPMF). The RPMF is then multiplied by the maximum observed value in the data set to determine the projected maximum concentration for each individual parameter. This projected maximum concentration is then used in a mass balance equation to determine if the resultant instream concentration would be higher than the acute water quality standard.

If the standard is lower than the calculated instream concentration, then the parameter is considered not to have a reasonable potential to exceed the standard and a limit is not required. The following is the mass balance equation.

$$C_3 = \frac{C_1 Q_1 + C_2 Q_2}{Q_1 + Q_2} \quad \text{Equation 2}$$

- $C_1$  = background concentration, mg/L
- $C_2$  = projected maximum discharge concentration, mg/L
- $C_3$  = instream concentration after mixing
- $Q_1$  =  $7Q_{10}$  = 7-day, 10-year, low-flow value for the receiving stream
- $Q_2$  = maximum flow of discharge (peak or average of highest flows over time)

#### **Outfall 001: Effluent Pollutant Limits**

##### Arsenic

Arsenic has had a maximum reported concentration of 0.041 mg/L. The lowest instream standard (human health) for arsenic is 0.018 mg/L. The background concentration developed for the previous permit is 0.0053 mg/L [Table 1, SOB 1996]. The maximum effluent flow is 200 gpm. Of 19 data points, the average was 0.024 mg/L and the standard deviation was 0.086 mg/L. The CV equals 3.6 which is higher than allowable in the table to determine a RPFM therefore a limit is required. The limit is determined using equation number 1 above.

$$C_3 = \frac{0.018 \text{ mg/L} (2690 \text{ gpm} + 200 \text{ gpm}) - (0.0053 \text{ mg/L} \times 2690 \text{ gpm})}{200 \text{ gpm}} = 0.19 \text{ mg/L}$$

Based on the calculation the allowable discharge could be as high as 0.190 mg/L.

The previous permit 30-day average limit was 0.044 mg/L. This limit was based on the same mixing calculation but an effluent flow of 1,300 gpm was used. This flow rate included 50 gpm from the 1300 Adit, which had a high arsenic concentration. Given that the 1300 Adit water is no longer discharged from this outfall the higher limits are not justified and based on antidegradation rules shall not be allowed [CFR 122.44(l)(1)]. Therefore, the limits shall remain the same as in the previous permit.

##### Cadmium

The highest cadmium concentration reported over the last three years has been 0.0005 mg/L. The acute instream standard is 0.0009 mg/L. The background concentration for Bear Creek is 0.00019 mg/L [Table 1, SOB modified 1997]. The maximum effluent flow is 200 gpm. Of 18 data points, the average was 0.000167 mg/L, and the standard deviation was 0.000114 mg/L. The CV equals 0.7 and the RPFM equals 2.7. The projected maximum

concentration in the discharge is 0.00135 mg/L. Using equation number 2 above the resulting instream concentration can be calculated from the discharge of the projected maximum concentration.

$$C_3 = \frac{(0.00019 \text{ mg} / \text{L} \times 2690 \text{ gpm}) + (0.00135 \text{ mg} / \text{L} \times 200 \text{ gpm})}{2690 \text{ gpm} + 200 \text{ gpm}} = 0.00027 \text{ mg} / \text{L}$$

The resulting concentration of 0.00027 mg/L is less than the acute or chronic standards; therefore, no limit is required for cadmium.

### Copper

The highest copper value reported over the last three years has been 0.003 mg/L. The acute instream standard is 0.0038 mg/L. The background concentration for Bear Creek is 0.0019 mg/L [Table 1, SOB modified 1997]. The maximum effluent flow is 200 gpm. Of 17 data points, the average was 0.00124 mg/L, and the standard deviation was 0.00056 mg/L. The CV equals 0.45 and the RPMF equals 2.1. The projected maximum concentration in the discharge is 0.0063 mg/L. Using equation number 2 above the resulting instream concentration can be calculated from the discharge of the projected maximum concentration.

$$C_3 = \frac{(0.0019 \text{ mg} / \text{L} \times 2690 \text{ gpm}) + (0.0063 \text{ mg} / \text{L} \times 200 \text{ gpm})}{2690 \text{ gpm} + 200 \text{ gpm}} = 0.0022 \text{ mg} / \text{L}$$

The resulting concentration of 0.0022 mg/L is less than the acute or chronic standards; therefore, no limit is required for copper.

### Iron

The highest iron value reported over the last three years has been 1.19 mg/L. The chronic instream standard is 1.0 mg/L. There is no acute standard for iron. The background concentration for Bear Creek is 0.56 mg/L [Table 1, SOB modified 1997]. The maximum effluent flow is 200 gpm. Of 18 data points the average was 0.48 mg/L and the standard deviation was 0.31 mg/L. The CV equals 0.8 and the RPMF equals 3.0. The projected maximum concentration in the discharge is 3.6 mg/L. Using equation number 2 above the resulting instream concentration can be calculated from the discharge of the projected maximum concentration.

$$C_3 = \frac{(0.056 \text{ mg} / \text{L} \times 2690 \text{ gpm}) + (3.6 \text{ mg} / \text{L} \times 200 \text{ gpm})}{2690 \text{ gpm} + 200 \text{ gpm}} = 0.3 \text{ mg} / \text{L}$$

The resulting concentration of 0.3 mg/L is less than the chronic standard; therefore, no limit is required for iron.

#### Lead and Mercury

There have been no detections of lead or mercury in the last three years. It is proposed that no limits be imposed for these parameters.

#### Manganese

The highest manganese value reported over the last three years has been 0.113 mg/L. The instream standard is 0.05 mg/L to protect beneficial uses. There is no acute or chronic standard for manganese. The background concentration for Bear Creek is 0.005 mg/L [Table 1, SOB modified 1997]. The maximum effluent flow is 200 gpm. Of 18 data points, the average was 0.045 mg/L, and the standard deviation was 0.018 mg/L. The CV equals 0.4 and the RPMF equals 1.9. The projected maximum concentration in the discharge is 0.215 mg/L. Using equation number 2 above the resulting instream concentration can be calculated from the discharge of the projected maximum concentration.

$$C_3 = \frac{(0.005 \text{ mg/L} \times 2690 \text{ gpm}) + (0.215 \text{ mg/L} \times 200 \text{ gpm})}{2690 \text{ gpm} + 200 \text{ gpm}} = 0.02 \text{ mg/L}$$

The resulting concentration of 0.02 mg/L is less than the standard to protect the beneficial uses therefore no limit is required for manganese.

#### Nitrogen Compounds

Nitrogen compounds were included in the original permit because active blasting was in progress. Blasting has been suspended for the last three years, and data indicates no increased nitrogen is currently being discharged. Nitrogen compounds shall not be included in the renewed permit.

#### Zinc

The highest zinc value reported over the last three years has been 0.02 mg/L. The instream chronic and acute standards are 0.037 mg/L. Because no analysis has been near the standard, zinc shall not be limited in this permit.

#### **Outfall 002: Effluent Pollutant Limits**

See original Statement of Basis dated December 1995 (modified in April 1997) for a discussion of Outfall 002 limits. The original limits developed for flows greater than the 7Q10 have been eliminated in this renewal. This outfall will be terminated when an alternate treatment system has been constructed and proven.

### **Outfall 005A&B: Effluent Pollutant Limits**

Outfall 005A&B is a discharge to ground water. The applicable standards are the human health standard or background conditions, which ever are highest. The only parameter that exceeds the human health standard in the discharge is arsenic. The human health standard for dissolved arsenic in ground water is 0.02 mg/L.

The effluent shall be treated prior to discharge to a septic system, which includes a septic tank, dosing chamber, and two drainfields. The effluent shall be treated by coprecipitation with iron prior to discharge to the septic tank. Preliminary data indicated that the effluent can be treated to approximately 0.02 mg/L dissolved arsenic. Arsenic precipitated with iron will settle out in the septic tank.

The background concentration in the ground water was derived from the average of the average data from each of four monitoring wells. Wells 8 A, B, and C are a nested set of wells below the first drainfield and well 7B is located below the second drainfield. The average background value was 0.036 mg/L [EDE, 1999].

It is proposed that the 0.036 mg/L arsenic background concentration be set as the 30-day average limit. Until data can be assessed from the treatment system no instantaneous maximum limit shall be imposed. Both the 30-day average and the need for an instantaneous maximum shall be reevaluated during the reissuance of this permit in five years.

A yearly sample shall also be collected from the effluent after discharge from the dosing tank and prior to discharge to the drainfields to ensure that precipitated arsenic is not being remobilized or being introduced into the system from other sources.

#### **H. Final Wastewater Effluent Limitations**

##### **Outfall 001**

**TABLE 1. NUMERIC EFFLUENT LIMITATIONS – Outfall 001**

Parameter	Concentration (mg/L) <sup>(1)</sup>		Allocated Annual Average Load <sup>(2)</sup> (lb/day)	Rationale
	30-Day Average	Instantaneous Maximum		
Total Suspended Solids (TSS)	20	30	29	BAT Guidelines for Ore Mining [40 CFR 440.102(a)]
Arsenic, Total Recoverable <sup>(3)</sup>	0.044	0.066	0.10	Water Quality Standards [Human Health, WQB-7] Anti-backsliding [40 CFR 122.44(l)(1)]

(1) See the definitions in Part I.A for explanation of terms.

(2) Calculations are based on the 30-day average values of flow and concentration.



- (3) For determination of metals use Total Recoverable method of digestion in *Methods for the Chemical Analysis of Water and Wastes*, Section 4.1. EPA-600/4-79-020, revised 1983. Use EPA or Department approved methods of analyses after digestion [40 CFR 136.3].

Effluent pH shall remain between 6.0 and 9.0 [ARM 17.30.623(2)(c)][40 CFR 440.102(a)].

There shall be no acute toxicity in the effluent discharged by the facility and no chronic toxicity outside the boundaries of the mixing zone [ARM 17.30.637(1)(d)] [ARM 17.30.507(1)(a)(b)].

There shall be no discharge of floating solids or visible foam in other than trace amounts [ARM 17.30.637(1)(b)][ARM 17.30.623(2)(f)].

There shall be no discharge, which causes visible oil sheen in the receiving stream [ARM 17.30.637(1)(b)].

There shall be no discharge of wastewater, which reacts or settles to form an objectionable sludge deposit or emulsion beneath the surface of the receiving stream or upon adjoining shorelines [ARM 17.30.637(1)(a)].

#### Outfall 002

See previous Statement of Basis dated December 1995 for a discussion and rational for permit limits. The original limits developed for flows greater than the 7Q10 have been eliminated in this renewal. This outfall will be terminated when an alternate treatment system has been constructed and proven.

#### Outfall 005A&B

**TABLE 2. NUMERIC EFFLUENT LIMITATIONS – Outfall 005A&B**

Parameter	Concentration (mg/L) <sup>(1)</sup>		Allocated Annual Average Load <sup>(2)</sup> (lb/day)	Rationale
	30-Day Average	Instantaneous Maximum		
Arsenic, Dissolved <sup>(3)</sup>	0.036	Not Applicable	0.009	Background Condition MCA 75-5-307

(1) See the definitions in Part I.A for explanation of terms.

(2) Calculations are based on the 30-day average values of flow and concentration.

(3) For determination of metals use dissolved methods in *Methods for the Chemical Analysis of Water and Wastes*, Section 4.1. EPA-600/4-79-020, revised 1983.

Effluent pH shall remain between 6.0 and 9.0 [ARM 17.30.1006(1)(b)][40 CFR 440.102(a)].

#### I. Self-Monitoring Requirements

## Effluent Monitoring

As a minimum, upon the effective date of this permit, the following constituents shall be monitored at the frequency and with the type of measurement indicated; samples or measurements shall be representative of the volume and nature of the monitored discharge. If no discharge occurs during the entire monitoring period, it shall be stated on the Discharge Monitoring Report Form [EPA No. 3320-1] that no discharge or overflow occurred.

**Outfall 001:** Compliance sample shall be collected prior to discharge to the Bear Creek.

**TABLE 3: EFFLUENT MONITORING REQUIREMENTS**

Parameter	Frequency	Type <sup>(1)</sup>
Effluent Flow Rate, gpm	Quarterly	Instantaneous
Total Suspended Solids, mg/L	Quarterly	Grab
pH, standard units	Quarterly	Instantaneous
Total Recoverable Arsenic, mg/L	Quarterly	Grab
Total Recoverable Cadmium, mg/L	Quarterly	Grab

<sup>(1)</sup> See the definitions in Part I.A. of the permit.

**Outfall 002:** Compliance sample shall be collected prior to discharge to the Bear Creek.

**TABLE 4. EFFLUENT MONITORING REQUIREMENTS**

Parameter	Frequency	Type <sup>(1)</sup>
Effluent Flow Rate, gpm	Daily	Instantaneous
Total Suspended Solids, mg/L	Weekly	Grab
Total Recoverable Cadmium, mg/L	Weekly	Grab
Total Recoverable Copper, mg/L	Weekly	Grab
Total Recoverable Iron, mg/L	Weekly	Grab
Total Recoverable Manganese, mg/L	Weekly	Grab
Total Recoverable Lead, mg/L	Weekly	Grab
Total Recoverable Zinc, mg/L	Weekly	Grab
Total Recoverable Cyanide, mg/L	Weekly	Grab
Total Recoverable Mercury, mg/L	Weekly	Grab
Total Recoverable Arsenic, mg/L	Weekly	Grab
pH, Std Units	Weekly	Grab

Parameter	Frequency	Type <sup>(1)</sup>
Total Ammonia as N, mg/L	Weekly	Grab
Thiocyanate plus Cyanate as N, mg/L	Weekly	Grab
Nitrate plus Nitrite as N, mg/L	Weekly	Grab
Total Nitrogen as N, mg/L	Weekly	Calculated

<sup>(1)</sup> See the definitions in Part I.A. of the permit.

**Outfall 005A:** Compliance samples shall be collected prior to discharge into the septic system.

**TABLE 5. EFFLUENT MONITORING REQUIREMENTS**

Parameter	Frequency	Type <sup>(1)</sup>
Effluent Flow Rate, gpm	Monthly	Instantaneous
pH, standard units	Monthly	Instantaneous
Dissolved Arsenic, mg/L	Monthly	Grab

<sup>(1)</sup> See the definitions in Part I.A. of the permit.

**Outfall 005B:** A sample shall be collected yearly, in July, of the effluent after discharge from the dosing chamber and prior to discharge to the drainfield system. The sample shall be analyzed for both total and dissolved arsenic.

#### J. Miscellaneous Discussion

##### Pollutant Loads

The original discharge permit issued in 1996 was based on a combined flow from all three outfalls of 1,350 gpm to Bear Creek. Fifty gpm was from the treatment system (Outfall 002) and had to meet nondegradation limits. The present treatment system only treats approximately 5 gpm, which is batch-treated when necessary. This is a large reduction in the overall load being discharged. Similarly, the discharge from the Crevice Adit has been reduced by 1,100 gpm to a maximum of 200 gpm. The concentrations in this water have not increased from the original permit. The permit limits have remained the same as in the previous permit decreasing the pollutant load by approximately 85 percent. The volume of discharge from the 1300 Adit (Outfall 005) has also decreased due to reclamation from 50 gpm to 15 gpm with a corresponding decrease in load of 70 percent. This water is now discharged to ground water where additional dilution and attenuation will take place prior to entering surface water.

The overall affect of reclamation and the issuance of this new permit is to decrease the load of pollutants to Bear Creek. The original permit allowed a load of 0.629 lbs/day of arsenic from the combined Outfall 001 and 003 plus 0.0032 lbs/day from Outfall 002. The new

permit allows a discharge of arsenic of 0.01 lbs/day from Outfall 001, 0.009 lbs/day from Outfall 005A&B and 0.00032 lbs/day from Outfall 002. This is a reduction of approximately 0.613 lbs of arsenic per day or 70 percent.

### Contingency Plans

The Environmental Management Bureau bonds for contingency treatment scenarios in case the preferred alternatives of treatment are down for repair or maintenance. The discharge from the Crevice Adit (Outfall 001) does not require a contingency plan because no treatment is required.

The treatment system for the tailing storage facility seepage associated with Outfall 002, is anticipated to be decommissioned and the outfall terminated in 2002. Therefore, a contingency plan is not required for this system. When the system is decommissioned, the effluent issuing from the tailing storage facility (approximately 1 gpm) will be treated in a non-discharging biological and evapotranspiration pond system. This system consists of a wet meadow habitat development site (HDS) and an upland HDS. Two contingency plans have been developed for the disposal of this water in the event that the treatment system is down for repair or maintenance or more water than anticipated is generated from the tailing storage facility.

The first and preferred contingency plan would be to pump the water from the lower lined wet meadow HDS to the upland HDS above the tailing storage facility. The unlined upland HDS area is underlain by a drainfield system. The effluent would be mixed with Crevice Adit water to dilute the mixture to the ground water arsenic standard of 0.02 mg/L prior to discharge. This contingency plan would not require a permit if the water were applied at agronomic rates. If agronomic rates are exceeded a new outfall could be requested through the permit process. This outfall could be permitted under the MPDES rules. All water quality standards would be met prior to discharge. There would be slight increases in the narrative guidelines for iron and manganese but no specified uses would be impaired.

The second contingency plan would require the mixing of Crevice Adit water (up to 200 gpm) in the wet meadow HDS with subsequent discharge of the overflow to Bear Creek via an existing ephemeral drainage. This contingency would require a new MPDES outfall (Outfall 006) but existing effluent limits, developed for Outfall 001, could be met and the outfall could be permitted under the MPDES rules.

The preferred alternative for the discharge of 1300 Adit water is through treatment and discharge to ground water (Outfall 005A&B). If the treatment system were to be down for repair or maintenance, Crevice Adit water (approximately 20 gpm) could be mixed with the 1300 Adit water prior to discharge to ground water. This contingency could be permitted under the MPDES rules.

A second contingency plan for the 1300 Adit water discharge is to bury a pipeline to the Crevice Adit pipeline and discharge both flows to Bear Creek through Outfall 001. This is the originally permitted method of discharge.

### Montana Environmental Policy Act (MEPA) Requirements

This permit will be available for public comment for a minimum of 30 days prior to action by the Department pursuant to ARM 17.30.1372. The Environmental Management Bureau is preparing an Environmental Impact Statement (EIS) on the Consolidated Closure Plan (CCP). This permit shall be appended to the EIS, and additional comments on the permit may be made through the EIS process. Alternatives and cumulative effects are addressed in the EIS. For this reason a separate Environmental Assessment (EA) has not been developed for this permit.

#### K. Information Sources

- (1) ARM Title 17, Chapter 30, Sub-chapter 5 – Mixing Zones in Surface and Ground Water.
- (2) ARM Title 17, Chapter 30, Sub-chapter 10 – Montana Ground Water Pollution Control System.
- (3) ARM Title 17, Chapter 30, Sub-chapter 13 - Montana Pollutant Discharge Elimination System (MPDES) Standards.
- (4) ARM Title 17, Chapter 30, Sub-chapter 7 - Nondegradation of Water Quality.
- (5) ARM Title 17, Chapter 30, Sub-chapter 6 - Surface Water Quality Standards.
- (6) Consolidated MPDES Permit Application Form 1 and Short Form 2C, received November 30, 2000.
- (7) EDE Consultants, (1999), TVX Mineral hill Mine, Hydrologic Monitoring data Trend Analysis Report, Table 5.2, Page 33.
- (8) MPDES Permit File No. MT-0030252, effective date of first permit April 1, 1996.
- (9) Montana Water Quality Act, 1995 and 1999.
- (10) Montana 303d List (1996), List of Waterbodies in Need of Total Maximum Daily Load Development.
- (11) 40 CFR Parts 440.102, Subpart J, July 1 1998, Copper, lead, Zinc, Gold, Silver, and Molybdenum Ores Subcategory, page 364.

PREPARED BY Terry Webster, January 2001

Signature

Date Finalized

## MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

### AUTHORIZATION TO DISCHARGE UNDER THE MONTANA POLLUTANT DISCHARGE ELIMINATION SYSTEM (MPDES)

In compliance with Mont. Code Annot. Section 75-5-101 *et seq.* and ARM Title 17, Chapter 30, Subchapters 5, 6, 7, and 13.

**TVX Mineral Hill Mine**  
PO Box 92  
Gardiner, MT 59030

is authorized to discharge **unaltered ground water from the Crevice Adit, treated wastewater from the tailing storage facility and treated mine adit water from the 1300 Adit**

to receiving waters named **Bear Creek and ground water respectively,**

in accordance with discharge point(s), effluent limitations, monitoring requirements and other conditions set forth herein. Authorization for discharge is limited to those outfalls specifically listed in the permit. Specified load allocations support and serve to define total maximum daily loads for the receiving waters affected.

This permit shall become effective thirty days after the date of issuance.

This permit and the authorization to discharge shall expire at midnight, five years from the date of issuance .

FOR THE MONTANA DEPARTMENT OF  
ENVIRONMENTAL QUALITY

Thomas D. Reid, Supervisor  
Water Quality Discharge Permit Section  
Water Protection Bureau

Dated this \_\_\_\_\_ day of

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I. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

A. Definitions.

1. The "**30-day (and monthly) average**," other than for fecal coliform bacteria, is the arithmetic average of all samples collected during a consecutive 30-day period or calendar month, whichever is applicable. Geometric means shall be calculated for fecal coliform bacteria. The calendar month shall be used for purposes of reporting self-monitoring data on discharge monitoring report forms.
2. The "**7-day (and weekly) average**," other than for fecal coliform bacteria, is the arithmetic mean of all samples collected during a consecutive 7-day period or calendar week, whichever is applicable. Geometric means shall be calculated for fecal coliform bacteria. The 7-day averages are applicable only to those effluent characteristics for which there are 7-day average effluent limitations. The calendar week which begins on Sunday and ends on Saturday, shall be used for purposes of reporting self-monitoring data on discharge monitoring report forms. Weekly averages shall be calculated for all calendar weeks in the month that have at least 4 days. For example, if a calendar week overlaps two months, the weekly average is calculated only in the month that contains four or more days of that week.
3. The "**Annual Average Load**" is the arithmetic mean of all 30-day or monthly average loads reported during the calendar year for a monitored parameter.
4. The "**Arithmetic Mean**" or "**Arithmetic Average**" for any set of related values means the summation of the individual values divided by the number of individual values.
5. "**BOD<sub>5</sub>**" is the five-day measure of pollutant parameter biochemical oxygen demand.
6. "**Bypass**" means the intentional diversion of waste streams from any portion of a treatment facility.
7. "**CBOD<sub>5</sub>**" is the five-day measure of pollutant parameter carbonaceous biochemical oxygen demand.
8. "**Composite samples**" shall be flow proportioned. The composite sample shall, as a minimum, contain at least four (4) samples collected over the compositing period. Unless otherwise specified, the time between the collection of the first sample and the last sample shall not be less than six (6) hours nor more than 24 hours. Acceptable methods for preparation of composite samples are as follows:
  - a. Constant time interval between samples, sample volume proportional to flow rate at time of sampling;

- b. Constant time interval between samples, sample volume proportional to total flow (volume) since last sample. For the first sample, the flow rate at the time the sample was collected may be used;
  - c. Constant sample volume, time interval between samples proportional to flow (i.e., sample taken every "X" gallons of flow); and,
  - d. Continuous collection of sample, with sample collection rate proportional to flow rate.
9. A **"Daily Maximum Limit"** specifies the maximum allowable discharge of a pollutant during a calendar day. Expressed as units of mass, the daily discharge is cumulative mass discharged over the course of the day. Expressed as a concentration, it is the arithmetic average of all measurements taken that day.
10. **"Department"** means the Montana Department of Environmental Quality (MDEQ).
11. **"EPA"** means the United States Environmental Protection Agency.
12. A **"grab"** sample, for monitoring requirements, is defined as a single "dip and take" sample collected at a representative point in the discharge stream.
13. An **"instantaneous"** measurement, for monitoring requirements, is defined as a single reading, observation, or measurement.
14. **"Load limits"** are mass-based discharge limits expressed in units such as lb/day.
15. A **"mixing zone"** is a limited area of a surface water body or aquifer where initial dilution of a discharge takes place and where water quality changes may occur. Also recognized as an area where certain water quality standards may be exceeded.
16. **"Nondegradation"** means the prevention of a significant change in water quality that lowers the quality of high-quality water for one or more parameters. Also, the prohibition of any increase in discharge that exceeds the limits established under or determined from a permit or approval issued by the Department prior to April 29, 1993.
17. **"Severe property damage"** means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.
18. **"Sewage Sludge"** is any solid, semi-solid or liquid residue that contains materials removed from domestic sewage during treatment. Sewage sludge includes, but is not limited to, primary and secondary solids and sewage sludge products.

19. The term "TMDL" means the total maximum daily load limitation of a parameter, representing the estimated assimilative capacity for a water body before other designated uses are adversely affected. Mathematically, it is the sum of wasteload allocations for point sources, load allocations for non-point and natural background sources, and a margin of safety.
20. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

B. Description of Discharge Points

The authorization to discharge provided under this permit is limited to those outfalls specifically designated below as discharge locations. Discharges at any location not authorized under an MPDES permit is a violation of the Montana Water Quality Act and could subject the person(s) responsible for such discharge to penalties under the Act. Knowingly discharging from an unauthorized location or failing to report an unauthorized discharge within a reasonable time from first learning of an unauthorized discharge could subject such person to criminal penalties as provided under Section 75-5-632 of the Montana Water Quality Act.

Outfall

Serial Number Description of Discharge Point

- |        |   |
|--------|---|
| 001    | The discharge consists of unaltered ground water from the Crevice Adit at the end of the discharge pipe, emptying to Bear Creek, located approximately 45° 04' 08" N latitude, 110° 38' 05" W longitude. The mixing zone extends from the point of discharge into Bear Creek to a point 100 feet downstream, approximately 10 river widths. |
| 002    | The discharge consists of treated water from the tailing storage facility, which discharges to Bear Creek, located approximately 45° 04' 05" N latitude, 110° 37' 43" W longitude. The mixing zone extends from the point of discharge into Bear Creek to a point 100 feet downstream, approximately 10 river widths.                       |
| 005A&B | The discharge consists of treated mine drainage discharging to ground water from two septic drainfields located approximately 45° 03' 57" N latitude, 110° 38' 07" W longitude. The mine drainage is mixed with sanitary waste prior to discharge. No mixing zone is required.  |

C. Specific Limitations

Wastewater Effluent Limitations

Effective immediately and lasting through the term of the permit, the quality of effluent discharged by the facility shall, as a minimum, meet the limitations as set forth below:

Outfall 001

TABLE 1. NUMERIC EFFLUENT LIMITS

Parameter	Concentration (mg/L) <sup>(1)(2)</sup>	
	30-Day Average	Instantaneous Maximum
Total Suspended Solids (TSS)	20	30
Arsenic, Total Recoverable	0.044	0.066

(1) See the definitions in Part I.A for explanation of terms.

(2) For determination of metals use Total Recoverable method of digestion in *Methods for the Chemical Analysis of Water and Wastes*, Section 4.1. EPA-600/4-79-020, revised 1983. Use EPA or Department approved, methods of analyses after digestion (40 CFR 136.3).

Effluent pH shall remain between 6.0 and 9.0

There shall be no acute toxicity in the effluent discharged by the facility and no chronic toxicity outside the boundaries of the mixing zone.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

There shall be no discharge which causes visible oil sheen in the receiving stream.

There shall be no discharge of wastewater, which reacts or settles to form an objectionable sludge deposit or emulsion beneath the surface of the receiving stream or upon adjoining shorelines.

Outfall 002

TABLE 2. (flow limits in Bear Creek at the 7Q10 (6 cfs))

Parameter	Concentration (mg/L) <sup>(1)</sup>	
	30-Day Average	Instantaneous Maximum
Total Suspended Solids	20	30
Total Recoverable <sup>(2)</sup> Cadmium	0.0057	0.0085
Total Recoverable Copper	0.03	0.045
Total Recoverable Iron	5.6	8.4
Total Recoverable Manganese	0.281	.422
Total Recoverable Lead, <sup>(4)</sup>	0.00028	0.00042
Total Recoverable Zinc	0.289	0.434
Total Recoverable Mercury, <sup>(4)</sup>	0.000006	0.000009
Total Recoverable Arsenic	0.0053	0.0077
Total Recoverable Cyanide, <sup>(5)</sup>	0.27	0.41
Total Nitrogen as N <sup>(3)</sup>	6.0	9.0

- (1) See the definitions in Part I.A for explanation of terms.
- (2) For determination of metals use Total Recoverable method of digestion in *Methods for the Chemical Analysis of Water and Wastes*, Section 4.14 EPA-600/4-79-020, revised 1983. Use EPA or Department approved, methods of analyses after digestion (40 CFR 136.3).
- (3) Total nitrogen as N includes: nitrate/nitrite as N, thiocyanate/cyanate as N, and total ammonia as N. Analysis below the detection limit will be considered 1/2 the detection limit for the total nitrogen calculation.
- (4) For the purposes of determining compliance with the effluent limitations the permittee shall use the Required Reporting Values (RRV) listed in DEQ Circular WQB-7. The sample results shall be deemed in compliance with the terms of this permit if the sample result is less than the RRV.
- (5) The discharge limit assumes zero background cyanide in Bear Creek.
- (6) Flow must be reported from calibrated staff gauge on a weekly basis.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

There shall be no discharge, which causes visible oil sheen in the receiving stream.

The pH of the discharge shall remain between 6.0 and 9.0 std units.

There shall be no acute toxicity in the effluent discharged by the facility and no chronic toxicity outside the boundaries of the mixing zone.

#### Outfall 005A&B

**TABLE 5. NUMERIC EFFLUENT LIMITS**

Parameter	Concentration (mg/L) <sup>(1)(2)</sup>	
	30-Day Average	Instantaneous Maximum
Arsenic, Dissolved	0.036	Not Applicable

(1) See the definitions in Part I.A. for explanation of terms.

(2) For determination of metals use dissolved method in *Methods for the Chemical Analysis of Water and Wastes*, Section 4.1. EPA-600/4-79-020, revised 1983

Effluent pH shall remain between 6.0 and 9.0

#### D. Self-Monitoring Requirements

##### Wastewater Discharge Monitoring

As a minimum, upon the effective date of this permit, the following constituents shall be monitored at the frequency and with the type of measurement indicated; samples or measurements shall be representative of the volume and nature of the monitored discharge. If no discharge occurs during the entire monitoring period, it shall be stated on the Discharge Monitoring Report Form (EPA No. 3320-1) that no discharge or overflow occurred.

**Outfall 001:** Compliance sample shall be collected prior to discharge to the Bear Creek.

**TABLE 6. EFFLUENT MONITORING REQUIREMENTS**

Parameter	Frequency	Type <sup>(1)</sup>
Effluent Flow Rate, gpm	Quarterly	Instantaneous
Total Suspended Solids, mg/L	Quarterly	Grab
pH, standard units	Quarterly	Instantaneous
Total Recoverable Arsenic, mg/L	Quarterly	Grab
Total Recoverable Cadmium, mg/L	Quarterly	Grab

<sup>(1)</sup> See the definitions in Part I.A. of the permit.

**Outfall 002:** Compliance sample shall be collected prior to discharge to the Bear Creek.

**TABLE 7. EFFLUENT MONITORING REQUIREMENTS**

Parameter	Frequency	Type <sup>(1)</sup>
Effluent Flow Rate, gpm	Daily	Instantaneous
Total Suspended Solids, mg/l	Weekly	Grab
Total Recoverable Cadmium, mg/l	Weekly	Grab
Total Recoverable Copper, mg/l	Weekly	Grab
Total Recoverable Iron, mg/l	Weekly	Grab
Total Recoverable Manganese, mg/l	Weekly	Grab
Total Recoverable Lead, mg/l	Weekly	Grab
Total Recoverable Zinc, mg/l	Weekly	Grab
Total Recoverable Cyanide, mg/l	Weekly	Grab
Total Recoverable Mercury, mg/l	Weekly	Grab
Total Recoverable Arsenic, mg/l	Weekly	Grab
pH, Std Units	Weekly	Grab
Total Ammonia as N, mg/l	Weekly	Grab
Thiocyanate plus Cyanate as N, mg/l	Weekly	Grab
Nitrate plus Nitrite as N, mg/l	Weekly	Grab
Total Nitrogen as N	Weekly	Calculated

(1) See the definitions in Part I.A. of the permit.

**Outfall 005A:** Compliance samples shall be collected prior to discharge into the septic system.

**TABLE 8. EFFLUENT MONITORING REQUIREMENTS**

Parameter	Frequency	Type <sup>(1)</sup>
Effluent Flow Rate, gpm	Monthly	Instantaneous
pH, standard units	Monthly	Instantaneous
Dissolved Arsenic, mg/L	Monthly	Grab



TABLE 8. EFFLUENT MONITORING REQUIREMENTS

Parameter	Frequency	Type <sup>(1)</sup>
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<sup>(1)</sup> See the definitions in Part I.A. of the permit.

**Outfall 005B:** A sample shall be collected yearly, in July, of the effluent after discharge from the dosing chamber and prior to discharge to the drainfield system. The sample shall be analyzed for both total and dissolved arsenic.

## II. MONITORING RECORDING AND REPORTING REQUIREMENTS

- A. Representative Sampling. Samples taken in compliance with the monitoring requirements established under Part I shall be collected from the effluent stream prior to discharge into the receiving waters. Samples and measurements shall be representative of the volume and nature of the monitored discharge.
- B. Monitoring Procedures. Monitoring must be conducted according to test procedures approved under Part 136, Title 40 of the Code of Federal Regulations, unless other test procedures have been specified in this permit. All flow-measuring and flow-recording devices used in obtaining data submitted in self-monitoring reports must indicate values within 10 percent of the actual flow being measured.
- C. Penalties for Tampering. The Montana Water Quality Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than \$10,000, or by imprisonment for not more than six months, or by both.
- D. Reporting of Monitoring Results. Self-monitoring results will be reported monthly. Monitoring results obtained during the previous reporting period shall be summarized and reported on a Discharge Monitoring Report Form (EPA No. 3320-1), postmarked no later than the 28th day of the month following the completed reporting period. If no discharge occurs during the reporting period, "no discharge" shall be reported. Legible copies of these, and all other reports required herein, shall be signed and certified in accordance with the "Signatory Requirements" (see Part IV.G of this permit), and submitted to the Department at the following address:

Montana Department of Environmental Quality  
Water Protection Bureau  
P.O. Box 200901  
Helena, Montana 59620-0901  
Phone: (406) 444-3080

- E. Compliance Schedules. Reports of compliance or noncompliance with, or any progress reports on interim and final requirements contained in any Compliance Schedule of this permit shall be submitted no later than 14 days following each schedule date.
- F. Additional Monitoring by the Permittee. If the permittee monitors any pollutant more frequently than required by this permit, using approved analytical methods as specified in

this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the Discharge Monitoring Report. Such increased frequency shall also be indicated.

G. Records Contents. Records of monitoring information shall include:

1. The date, exact place, and time of sampling or measurements;
2. The initials or name(s) of the individual(s) who performed the sampling or measurements;
3. The date(s) analyses were performed;
4. The time analyses were initiated;
5. The initials or name(s) of individual(s) who performed the analyses;
6. References and written procedures, when available, for the analytical techniques or methods used; and
7. The results of such analyses, including the bench sheets, instrument readouts, computer disks or tapes, etc., used to determine these results.

H. Retention of Records. The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least three years from the date of the sample, measurement, report or application. This period may be extended by request of the Department at any time. Data collected on site, copies of Discharge Monitoring Reports, and a copy of this MPDES permit must be maintained on site during the duration of activity at the permitted location.

I. Twenty-four Hour Notice of Noncompliance Reporting.

1. The permittee shall report any serious incidents of noncompliance as soon as possible, but no later than twenty-four (24) hours from the time the permittee first became aware of the circumstances. The report shall be made to the Water Protection Bureau at (406) 444-3080 or the Office of Disaster and Emergency Services at (406) 841-3911. The following examples are considered serious incidents:
  - a. Any noncompliance which may seriously endanger health or the environment;
  - b. Any unanticipated bypass which exceeds any effluent limitation in the permit (See Part III.G of this permit, "Bypass of Treatment Facilities").; or

- c. Any upset which exceeds any effluent limitation in the permit (See Part III.H of this permit, "Upset Conditions").
  2. A written submission shall also be provided within five days of the time that the permittee becomes aware of the circumstances. The written submission shall contain:
    - a. A description of the noncompliance and its cause;
    - b. The period of noncompliance, including exact dates and times;
    - c. The estimated time noncompliance is expected to continue if it has not been corrected; and
    - d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.
  3. The Department may waive the written report on a case-by-case basis if the oral report has been received within 24 hours by the Water Protection Bureau, by phone, (406) 444-3080.
  4. Reports shall be submitted to the addresses in Part II.D of this permit, "Reporting of Monitoring Results".
- J. Other Noncompliance Reporting. Instances of noncompliance not required to be reported within 24 hours shall be reported at the time that monitoring reports for Part II.D of this permit are submitted. The reports shall contain the information listed in Part II.I.2 of this permit.
- K. Inspection and Entry. The permittee shall allow the head of the Department or the EPA or an authorized representative thereof, upon the presentation of credentials and other documents as may be required by law, to:
1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;
  2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
  3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and
  4. Sample or monitor at reasonable times, for the purpose of assuring permit compliance, any substances or parameters at any location.

### III. COMPLIANCE RESPONSIBILITIES

- A. Duty to Comply. The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application. The permittee shall give the Department advance notice of any planned changes at the permitted facility or of an activity which may result in permit noncompliance.
- B. Penalties for Violations of Permit Conditions. The Montana Water Quality Act provides that any person who violates a permit condition of the Act is subject to civil or criminal penalties not to exceed \$10,000 per day of such violation. Any person who willfully or negligently violates permit conditions of the Act is subject to a fine of not more than \$50,000 per day of violation, or by imprisonment for not more than 2 years, or both, for subsequent convictions. MCA 75-5-611(a) also provides for administrative penalties not to exceed \$10,000 for each day of violation and up to a maximum not to exceed \$100,000 for any related series of violations. Except as provided in permit conditions on Part III.G of this permit, "Bypass of Treatment Facilities" and Part III.H of this permit, "Upset Conditions", nothing in this permit shall be construed to relieve the permittee of the civil or criminal penalties for noncompliance.
- C. Need to Halt or Reduce Activity not a Defense. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.
- D. Duty to Mitigate. The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.
- E. Proper Operation and Maintenance. The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit. However, the permittee shall operate, as a minimum, one complete set of each main line unit treatment process whether or not this process is needed to achieve permit effluent compliance.
- F. Removed Substances. Collected screenings, grit, solids, sludges, or other pollutants removed in the course of treatment shall be disposed of in such a manner so as to prevent any pollutant from entering any waters of the state or creating a health hazard. Any sludges removed from the facility shall be disposed of in accordance with 40 CFR 503, 258 or other applicable rule. EPA and MDEQ shall be notified at least 180 days prior to such disposal taking place.
- G. Bypass of Treatment Facilities:

1. Bypass not exceeding limitations. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of Parts III.G.2 and III.G.3 of this permit.
2. Notice:
  - a. Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least 10 days before the date of the bypass.
  - b. Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required under Part II.I of this permit, "Twenty-four Hour Reporting".
3. Prohibition of bypass.
  - a. Bypass is prohibited and the Department may take enforcement action against a permittee for a bypass, unless:
    - (1) The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
    - (2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgement to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and
    - (3) The permittee submitted notices as required under Part III.G.2 of this permit.
  - b. The Department may approve an anticipated bypass, after considering its adverse effects, if the Department determines that it will meet the three conditions listed above in Part III.G.3.a of this permit.

H. Upset Conditions.

1. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with technology based permit effluent limitations if the requirements of Part III.H.2 of this permit are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review (i.e., Permittees will have the opportunity for a judicial determination on any claim

of upset only in an enforcement action brought for noncompliance with technology-based permit effluent limitations).

2. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:
    - a. An upset occurred and that the permittee can identify the cause(s) of the upset;
    - b. The permitted facility was at the time being properly operated;
    - c. The permittee submitted notice of the upset as required under Part II.I of this permit, "Twenty-four Hour Notice of Noncompliance Reporting"; and
    - d. The permittee complied with any remedial measures required under Part III.D of this permit, "Duty to Mitigate".
  3. Burden of proof. In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof.
- I. Toxic Pollutants. The permittee shall comply with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.
- J. Changes in Discharge of Toxic Substances. Notification shall be provided to the Department as soon as the permittee knows of, or has reason to believe:
1. That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":
    - a. One hundred micrograms per liter (100 µg/l);
    - b. Two hundred micrograms per liter (200 µg/l) for acrolein and acrylonitrile; five hundred micrograms per liter (500 µg/l) for 2,4-dinitrophenol and for 2-methyl-4, 6-dinitrophenol; and one milligram per liter (1 mg/l) for antimony;
    - c. Five (5) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7); or
    - d. The level established by the Department in accordance with 40 CFR 122.44(f).
  2. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the



permit, if that discharge will exceed the highest of the following "notification levels":

- a. Five hundred micrograms per liter (500 µg/l);
- b. One milligram per liter (1 mg/l) for antimony;
- c. Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7); or
- d. The level established by the Department in accordance with 40 CFR 122.44(f).

#### IV. GENERAL REQUIREMENTS

- A. Planned Changes. The permittee shall give notice to the Department as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when the alteration or addition could significantly change the nature or increase the quantity of pollutant discharged. This notification applies to pollutants which are not subject to effluent limitations in the permit.
- B. Anticipated Noncompliance. The permittee shall give advance notice to the Department of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.
- C. Permit Actions. This permit may be revoked, modified and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.
- D. Duty to Reapply. If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. The application must be submitted at least 180 days before the expiration date of this permit.
- E. Duty to Provide Information. The permittee shall furnish to the Department, within a reasonable time, any information which the Department may request to determine whether cause exists for revoking, modifying and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Department, upon request, copies of records required to be kept by this permit.
- F. Other Information. When the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or any report to the Department, it shall promptly submit such facts or information with a



narrative explanation of the circumstances of the omission or incorrect submittal and why they weren't supplied earlier.

G. Signatory Requirements. All applications, reports or information submitted to the Department shall be signed and certified.

1. All permit applications shall be signed as follows:
  - a. For a corporation: by a responsible corporate officer;
  - b. For a partnership or sole proprietorship: by a general partner or the proprietor, respectively;
  - c. For a municipality, State, Federal, or other public agency: by either a principal executive officer or ranking elected official.
2. All reports required by the permit and other information requested by the Department shall be signed by a person described above or by a duly authorized representative of that person. A person is considered a duly authorized representative only if:
  - a. The authorization is made in writing by a person described above and submitted to the Department, and
  - b. The authorization specified either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)
3. Changes to authorization. If an authorization under Part IV.G.2 of this permit is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Part IV.G.2 of this permit must be submitted to the Department prior to or together with any reports, information, or applications to be signed by an authorized representative.
4. Certification. Any person signing a document under this section shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly

responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

- H. Penalties for Falsification of Reports. The Montana Water Quality Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction be punished by a fine of not more than \$25,000 per violation, or by imprisonment for not more than six months per violation, or by both.
- I. Availability of Reports. Except for data determined to be confidential under 40 CFR Part 2, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Department. As required by the Clean Water Act, permit applications, permits and effluent data shall not be considered confidential.
- J. Oil and Hazardous Substance Liability. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Clean Water Act.
- K. Property or Water Rights. The issuance of this permit does not convey any property or water rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.
- L. Severability. The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.
- M. Transfers. This permit may be automatically transferred to a new permittee if:
  - 1. The current permittee notifies the Department at least 30 days in advance of the proposed transfer date;
  - 2. The notice includes a written agreement between the existing and new Permittees containing a specific date for transfer of permit responsibility, coverage, and liability between them;
  - 3. The Department does not notify the existing permittee and the proposed new permittee of an intent to revoke or modify and reissue the permit. If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in Part VLM.2 of this permit; and
  - 4. Required annual and application fees have been paid.

- N. Fees. The permittee is required to submit payment of an annual fee as set forth in ARM 17.30.201. If the permittee fails to pay the annual fee within 90 days after the due date for the payment, the Department may:
1. Impose an additional assessment consisting of 15% of the fee plus interest on the required fee computed at the rate established under 15-31-510(3), MCA, or
  2. Suspend the processing of the application for a permit or authorization or, if the nonpayment involves an annual permit fee, suspend the permit, certificate or authorization for which the fee is required. The Department may lift suspension at any time up to one year after the suspension occurs if the holder has paid all outstanding fees, including all penalties, assessments and interest imposed under this sub-section. Suspensions are limited to one year, after which the permit will be terminated.
- O. Reopener Provisions. This permit may be reopened and modified (following proper administrative procedures) to include the appropriate effluent limitations (and compliance schedule, if necessary), or other appropriate requirements if one or more of the following events occurs:
1. Water Quality Standards: The water quality standards of the receiving water(s) to which the permittee discharges are modified in such a manner as to require different effluent limits than contained in this permit.
  2. Water Quality Standards are Exceeded: If it is found that water quality standards or trigger values in the receiving stream are exceeded either for parameters included in the permit or others, the department may modify the effluent limits or water management plan.
  3. TMDL or Wasteload Allocation: TMDL requirements or a wasteload allocation is developed and approved by the Department and/or EPA for incorporation in this permit.
  4. Water Quality Management Plan: A revision to the current water quality management plan is approved and adopted which calls for different effluent limitations than contained in this permit.
  5. Toxic Pollutants: A toxic standard or prohibition is established under Section 307(a) of the Act for a toxic pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitation for such pollutant in his permit.

DRAFT

**APPENDIX D**

**TVX**

**FAIL-SAFE WATER TREATMENT CONTNGENCIES**

**FOR**

**BONDING PURPOSES MEMO**



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**TVX Mineral Hill Mine**  
Operated by **Amerikanuak, Inc.**

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PO Box 92 • Gardiner, Montana 59030-0092  
Telephone: (406) 848-7421 • FAX (406) 848-7935  
aki@montana.com

January 10, 2001

Pat Plantenberg  
Montana Department of Environmental Quality  
Hard Rock Program  
P.O. Box 200901  
Helena, Montana 59620-0901

RE: Fail-safe water treatment contingencies for bonding purposes.

Dear Pat:

This letter responds to your inquiry regarding worst-case contingencies for water treatment at Mineral Hill Mine. As you know there are three water flows that must be managed. All of these flows are currently permitted under MPDES permit MT-0030252 as:

Outfall 001 Crevice Adit

Outfall 002 TSF seepage

Outfall 003 1300 Adit

The TVX Mineral Hill Mine Consolidated Closure Plan (CCP) discusses short and long-term management plans for each of these flows, which are reiterated in brief below.

## **CCP Concepts**

### **Crevice Adit**

The Crevice Adit flow consists of sill and decant drillhole drainage. The decant holes would be plugged and the sill water would be piped via buried plastic pipe to the existing 001 outfall in Bear Creek. Discharge rate would be reduced from a maximum permitted 1300 gpm to a maximum permitted 200 gpm. No treatment is necessary for this water.



**TSF seepage**

The TSF seepage is currently collected in the Seepage Collection Pond (SCP), pumped periodically to the RO/evaporation treatment plant located in the mill building, treated, and discharged to Bear Creek at outfall 002. DEQ has given approval to construct and operate the full-scale biological treatment system, as described in the CCP, consisting of four treatment stages in a series of concrete vaults. Effluent of this system would ultimately report to the SCP (become wet meadow) for evapotranspiration, and if necessary, be pumped to the upland HDS after mixing with Crevice water to meet groundwater standards. The RO/evaporation system would continue to operate until the biological system flow and quality design criteria have been achieved. At that time, the RO/evaporation system would be shut down and decommissioned. No contingency for this plan is proposed in the CCP.

**1300 Adit**

The 1300 Adit is an internal MPDES outfall, tributary to the 001 pipeline prior to discharge in Bear Creek. The CCP proposes to route the flow to a chemical addition building where dissolved arsenic would be co-precipitated via iron addition. This is proven industry technology, which has been borne out in site specific bench and pilot scale studies. Discharge would be made to groundwater via the existing septic drain field system. No contingency to this proven technology is proposed in the CCP.

You have requested certain fail-safe treatment plans for bonding requirements. Such plans are presented below. They would apply equally to the Existing Plan and the Applicant's Proposed Plan as discussed in drafts of the DEIS chapter 2.

## **Failsafe Plans (Contingency Only)**

**Crevice Adit**

No treatment is necessary for this water, and no fail-safe treatment plans are required.

**TSF seepage**

In the event the TSF water management facilities are not achieving permitted performance, the semi-treated seepage can be mixed with additional Crevice Adit water and discharged via two outfall options.

Option A. Discharge to the upland HDS. Up to 200 gpm of Crevice Adit water could be routed down the buried Crevice Adit pipeline (Figure 1). This water would be mixed with the semi-treated TSF seepage water at the mix box and monitored prior to discharge in the upland HDS. The only difference between this contingency and the CCP is the application rates to the upland HDS would be above the agronomic application rates, and discharge would be made to groundwater. Water quality of the mixed water would meet groundwater standards with the slight exception of iron and manganese (Table 1). Minor soil attenuation would treat this water below standards and no mixing zone would be required.

Option B. Should discharge to the upland HDS be undesirable, for whatever reason, the diluting Crevice Adit water would be routed directly to the wet meadow HDS for mixing with the semi-treated biological system effluent. Water quality would meet MPDES permit limitations following mixing, and if necessary, following a mixing zone in Bear Creek (Table 2). From the wet meadow, the mixed water would discharge to Bear Creek via an ephemeral wash (Figure 1).

Up to 200 gpm of Crevice Adit water was used in the mixing models to assess mass balance water quality. Bear Creek flows vary widely. However, in the spring and early summer when the TSF seepage would occur, Creek flow will be high (well above 6-cfs). For option analyses, we have used 6-cfs discharge criteria for Bear Creek and have evaluated not only Crevice Adit water mixing, but also the additional dilution in Bear Creek.

Crevice water would be delivered to the TSF for mixing via the reconfigured gravity pipeline, which is currently used to pump SCP water to the treatment plant. The reconfigured system would be upgraded (and is bonded) under the CCP. Under option A, semi-treated TSF seepage would be pumped to the upland HDS (<1.0 gpm). Crevice flow would be entirely gravity driven. Under option B, all flow would be gravity driven; no pumping is required.

Mr. Pat Plantenberg

January 10, 2001

Page 3

**1300 Adit**

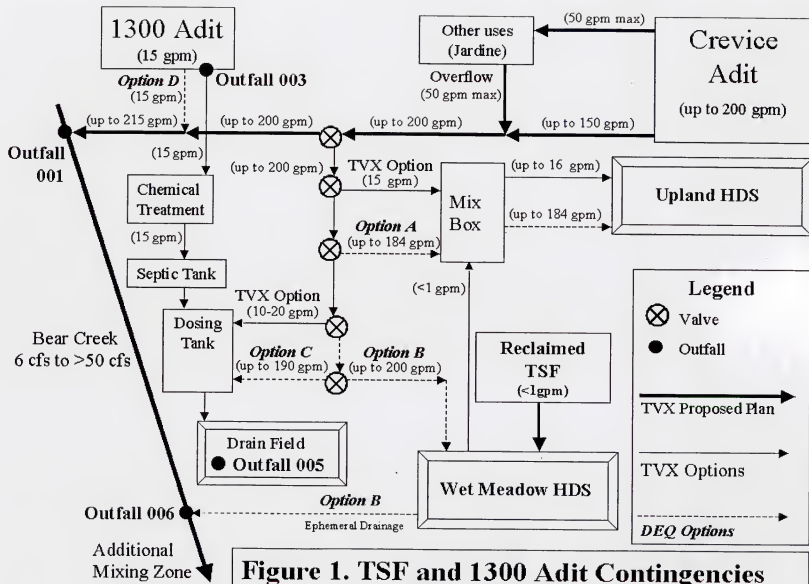
The CCP treatment plan has proven to be more effective than necessary to achieve MDPES permit limitations for discharge to groundwater (bench and pilot scale studies). If, for whatever reason, treatment efficiency was to decline to 95%, the treated water would achieve the lowest estimate of the background arsenic groundwater standard; i.e., 36  $\mu\text{g/l}$  (Table 3). If some component of this very simple treatment system was to fail and require repair or replacement, there could be a brief period of suspended treatment. In the remote situation where DEQ forecloses on the bond, a short-term groundwater mixing zone could be permitted. Should additional diluting Crevice Adit water be desirable for the 1300 groundwater mixing zone, a simple pipe connection could be made at the intersecting point of the buried 1300 and Crevice Adit pipelines. No pumping would be required. The system would be 100% gravity driven, require no heat or electrical power (buried), and there would be no moving parts.

The CCP water management options will provide reliable and positive disposition of the subject streams. However, for bonding purposes, there are simple and workable contingency options for the 1300 Level and TSF seepage. Please let us know if you need additional detail.

Sincerely,

Frank Bergstrom  
General Manager

Attachments



**Table 1 - Water Quality and Mixing Options (Contingency Only)****Option A - Mix partially treated TSF seepage water with Crevice water and land apply**

TSF effluent from the anaerobic cells only (5)

Maximum Crevice mixing water ranges from 135 to 150 gpm (use 135 gpm in analyses)

Parameter	Crevice Water (mg/l) (4)	Anaerobic Treated TSF Seepage (mg/l) (5)(1)	Maximum 135:1 Mixed Water (mg/l)	Groundwater Standard (mg/l)	Comments	Minimum Required Crevice Dilution Flow (gpm)
Cu	0.001	0.022	0.001154	1.3 (6)	Compliant	-1.0
Fe	0.04	45.6	0.375	0.3 (7)	Compliant	174.2 See note 3
Mn	0.011	5.9	0.054301	0.05 (7)	Compliant	150.0 See note 3
As	0.005	0.072	0.005493	0.02 (1)	Compliant	3.5
Nitrate	0.02	63.2 (2)	0.484559	10	Compliant	5.3
TDS	215	6873	263.9559	500 (8)	Compliant	22.4
CNtot	< 0.001	0.26 (2)	0.002904	0.2	Compliant	0.3

**Flows:**

Crevice flow range, 185 to 200 gpm (or more) in spring-summer, with 50 gpm going to Jardine uses. Use 135 gpm low flow in model analysis.

TSF flow range, 0 gpm winter to 1 gpm spring attenuated by TSF storage. Use 1 gpm in model analyses for conservatism.

**Notes:**

1. Some treated concentrations are proportional to influent concentration. The maximum influent may not be reflected in the test data.
2. The average nitrate and CNtot from later Shepherd Miller tests since the initial tests did not analyze for these constituents.
3. Soil attenuation would remove Fe and Mn to achieve lower concentrations.
4. Data from 24 November, 2000 Crevice sample.
5. Anaerobic test data from Knight & Piesold pilot tests, November 19, 1999, peak value after the initial month (March) of operation, unless noted.
6. Human health criteria.
7. Secondary MCL for aesthetic qualities.
8. EPA secondary drinking water MCL.

**Table 2 - Water Quality and Mixing Options (Contingency Only)****Option B - Mix partially treated TSF water with Crevice water and Discharge to Bear Creek**

TSF effluent from the anaerobic cells only (6)

(6 cfs Bear Creek flow discharge standards)

Maximum Crevice mixing water ranges from 135 to 150 gpm (use 135 gpm in analyses)

Parameter	Crevice Water (mg/l) (2)	Anaerobic Treated TSF Water (mg/l) (6)(1)	Maximum 135:1 Mixed Water (mg/l)	Surface Discharge Standard (mg/l) (4)	Comments	Minimum Required Crevice Compliance Flow (gpm)
Cu	0.001	0.022	0.001154	0.03	Compliant	-0.3
Fe	0.04	45.6	0.375	5.6	Compliant	7.2
Mn	0.011	5.9	0.054301	0.281	Compliant	20.8
As	0.005	0.072	0.005493	0.0053	Compliant (5)	222.3 See note 5
Nitrate	0.02	63.2 (3)	0.484559	10	Compliant	5.3
TDS	215	6873	263.9559	500	Compliant	22.4
CNtot	< 0.001	0.26 (3)	0.002904	0.2	Compliant	0.3

**Flows:**

Crevice flow range, 185 to 200 gpm (or more) in spring-summer, with 50 gpm going to Jardine uses. Use 135 gpm low flow in model analysis.  
 TSF flow range, 0 gpm winter to 1 gpm spring attenuated by TSF storage. Use 1 gpm in model analyses for conservatism.

**Notes:**

1. Some treated concentrations are proportional to influent concentration. The maximum influent may not be reflected in the test data.
2. Data from 24 November, 2000 Crevice sample.
3. Data from Table 1, Shepherd Miller, Biological Treatment System, Dec. 20, 2000.
4. Standards from outfall 002 requirements for Bear Creek flows of 6 cfs (conservative as flows would be above 12.5 cfs for spring discharges).
5. **NOTE:** Analytically/numerically compliant. Additional dilution would occur in the mixing zone in Bear Creek (a minimum of 2,692:1 at 6 cfs up to 22,440:1 at 50 cfs).
6. Anaerobic data from Knight & Piesold pilot tests, November 19, 1999, peak value after the initial month (March) of operation, unless noted.

**Table 3 - 1300 Level Water Management Analyses and Contingency**

Arsenic the only parameter of issue.

Assume 95% treatment efficiency of treatment (as proven by pilot testing).

Analysis includes 95% treatment with land application as well as mixing with Crevice and discharge to drainfield or to Bear Creek.

Parameter	Crevice Water (mg/l) (4)	1300 Water (mg/l) (3)	Mixed Water (2:1) (mg/l)	Treated Water (mg/l)	Standard (mg/l)	Comments	Minimum Required Crevice Compliance Flow (gpm)
As, treatment/drainfield	na	0.6	na	0.03	<b>0.037 (1)</b>	Compliant	na <b>Preferred plan</b>
As, mix/drainfield	0.005	0.6	0.023	na	<b>0.037 (1)</b>	Compliant	17.6 <b>Option A Figure 1</b>
As, mix/discharge	0.005	0.6	0.023	na	0.044 (2)	Compliant	14.3

1. Groundwater compliant for drainfield application (based on background water quality).
2. Mixed water directly in compliance with outfall 001 discharge criteria.
3. 10 gpm (could double seasonally, requiring double the Crevice water (35.2 gpm))

**Conclusion:** The preferred option of treatment and land application is viable as are contingency mix and land apply or direct discharge options.





**APPENDIX E-1**  
**1999 WATER MONITORING RESOURCES REPORT**  
**FOR THE**  
**OLD TAILINGS NORTH SITE**  
**MINERAL HILL MINE, PARK COUNTY MONTANA**



**1999 WATER RESOURCES MONITORING REPORT  
FOR OLD TAILINGS NORTH SITE  
MINERAL HILL MINE  
PARK COUNTY, MONTANA**

*Prepared for:*

TVX Mineral Hill Mine  
PO Box 92  
Gardiner, MT 59030

*Prepared by:*

Maxim Technologies, Inc.  
303 Irene Street; PO Box 4699  
Helena, MT 59604

April 2000

**TABLE 4**  
**FIELD PARAMETERS FOR MONITORING WELLS**  
**OTN STUDY - MINERAL HILL MINE**

Well No. <sup>1</sup>	Date	Depth to Water (ft) <sup>2</sup>	SC <sup>3</sup> (umhos/cm)	pH (au) <sup>3</sup>	Temp. (C) <sup>4</sup>
OTN-1	4-2-97	6.95	522	6.78	2.5
	7-28-97	7.28	575	6.89	8.0
	10-9-97	7.55			
	1-27-98	7.87			
	5-12-98	7.86			
	9-17-98	8.62			
	12-7-98	7.98			
	3-16-99	8.23			
	6-14-99	7.98			
	9-21-99	8.87			5.0
	12-7-99	8.07			
OTN-2S	4-1-97	1.78	1,083	5.44	3.0
	7-28-97	1.87	1,038	4.88	11.5
	10-9-97	2.45			
	1-27-98	4.11			
	5-12-98	3.71			
	6-26-98	3.59	1,041	5.12	7.5
	9-17-98	5.76	1,141	5.12	12.0
	12-7-98	5.72			
	3-16-99	6.81			
	6-14-99	4.16	1,106	5.83	8.0
	9-21-99	5.42	992	4.89	12.0
	12-7-99	6.92			
OTN-2D	4-1-97	2.12	671	7.95	5.0
	7-28-97	2.25	624	7.94	9.0
	10-9-97	2.93			
	1-27-98	4.41			
	5-12-98	4.01			
	6-26-98	3.93	639	8.08	5.5
	9-17-98	5.92	633	7.76	7.0
	12-7-98	5.88			
	3-16-99	6.85			
	6-14-99	4.49	623	7.76	6.5
	9-21-99	5.67	617	7.86	9.0
	12-7-99	6.98			
OTN-3	4-2-97	5.08	1,194	4.96	4.0
	7-28-97	5.38	960	4.79	11.5
	10-9-97	5.95			
	1-27-98	6.88			
	5-12-98	6.32			
	9-17-98	8.00			
	12-7-98	7.82			
	3-16-99	8.61			
	6-14-99	6.39			
	9-21-99	7.64			8.5
	12-7-99	8.57			
OTN-4	4-1-97	3.82	1,196	5.43	3.0
	7-28-97	4.33	1,110	4.58	13.5
	10-9-97	4.83			
	1-27-98	6.00			
	5-12-98	5.51			
	9-17-98	7.73			

MHM-OTN/Mxim/4-7-00

MINERAL HILL MINE OTN MONITORING

**TABLE 4**  
**FIELD PARAMETERS FOR MONITORING WELLS**  
**OTN STUDY - MINERAL HILL MINE**

Well No. <sup>1</sup>	Date	Depth to Water (ft) <sup>2</sup>	SC <sup>3</sup> (umhos/cm)	pH (au) <sup>3</sup>	Temp. (C) <sup>3</sup>
	12-7-98	7.37			7.0
	3-19-99	8.48			
	6-14-99	5.74			
	9-21-99	7.09			
	12-7-99	8.82			
OTN-5	4-1-97	4.03	876	6.66	3.5
	7-28-97	4.78	915	5.58	11.0
	10-9-97	5.20			
	1-27-98	6.65			
	5-12-98	8.30			
	9-17-98	8.93			
	12-7-98	8.87			
	3-18-99	9.95			
	6-14-99	6.68			
	9-21-99	8.12			6.5
	12-7-99	10.10			
OTN-6	4-2-97	5.76	598	5.82	3.0
	7-28-97	6.90	636	6.59	12.5
	10-9-97	7.11			
	1-27-98	7.95			
	5-12-98	8.82			
	6-26-98	6.35	564	6.96	8.0
	9-17-98	7.81	669	8.81	12.0
	12-7-98	7.27			
	3-18-99	7.53			
	6-14-99	6.36	555	7.18	7.5
	9-21-99	7.52	562	7.17	12.0
	12-7-99	7.45			
OTN-7	4-2-97	3.62	960	5.66	4.0
	7-28-97	4.78	864	5.79	11.5
	10-9-97	5.31			
	1-27-98	6.12			
	5-12-98	5.12			
	9-17-98	7.23			
	12-7-98	6.77			
	3-18-99	7.49			
	6-14-99	4.99			
	9-21-99	6.34			9.0
	12-7-99	7.53			
OTN-8	4-2-97	12.72	709	6.70	6.0
	7-28-97	13.08	783	6.72	7.5
	10-9-97	13.53			
	1-27-98	14.70			
	5-12-98	14.18			
	9-17-98	15.48			
	12-7-98	16.01			
	3-18-99	16.86			
	6-14-99	15.45			
	9-21-99	15.90			6.0
	12-7-99	16.69			
OTN-9	4-2-97	23.06	913	6.73	6.5
	7-28-97	23.51	612	6.79	7.5

**TABLE 4**  
**FIELD PARAMETERS FOR MONITORING WELLS**  
**OTN STUDY - MINERAL HILL MINE**

Well No. <sup>1</sup>	Date	Depth to Water (ft) <sup>2</sup>	SC <sup>3</sup> (umhos/cm)	pH (su) <sup>3</sup>	Temp. (C) <sup>3</sup>
OTN-9	10-9-97	23.85			8.0
	1-27-98	24.34			
	5-12-98	24.06			
	9-17-98	23.99			
	12-7-98	24.62			
	3-16-99	24.95			
	6-14-99	23.48			
	9-21-99	24.38			
	12-7-99	24.88			

<sup>1</sup> See Figure 1 for well locations.

<sup>2</sup> Water levels from top of measuring point.

<sup>3</sup> SC = specific conductance; umhos/cm = micromhos per centimeter; su = standard units; C = degrees Celsius.

## TABLES





Table E-1. Final Draft Reclamation Bond Summary for Agency Modified Plan

ITEM	AGENCY MODIFIED PLAN	
<b>Direct Costs:</b>		
<i>Item # 1 Facilities</i>		\$ 737,000.00
<i>Item # 2 Tailings Storage Facility</i>		\$ 341,000.00
<i>Item # 3 Old Tailings South</i>		\$ 6,160.00
<i>Item # 4 Roads</i>		\$ 226,000.00
<i>Item # 5 Underground Openings</i>		\$ 50,000.00
<i>Item # 6 Development Rock Piles</i>		\$ 459,000.00
<i>Item # 7 Miscellaneous</i>		\$ 90,000.00
<i>Item # 8 Interim Maintenance and Shutdown</i>		\$ 2,500.00
<i>Item # 9 Site Management During Reclamation</i>		\$ 500,000.00
<b>Subtotal</b>		<b>\$2,411,660.00</b>
<b>Indirect Costs:</b>		
<i>Contingencies</i>	5%	\$ 120,583.00
<i>Mobilization</i>	5%	\$ 120,583.00
<i>Engineering Design</i>	5%	\$ 120,583.00
<i>Agency Administration</i>	5%	\$ 120,583.00
<i>Inflation (3% over 5 years)</i>	16%	\$ 385,865.00
<b>Total Reclamation Bond Amount</b>		<b>\$3,280,000.00</b>
<b>Water Treatment Bond</b>		<b>\$5,189,000.00</b>
<b>Grand Total</b>		<b>\$8,469,000.00</b>

**Table E-2. OTS Lysimeter Water Quality Analysis**

<b>Lysimeter Number</b>	<b>pH in Standard Units</b>					
	<b>18</b>	<b>19</b>	<b>20</b>	<b>21</b>	<b>22</b>	<b>32</b>
3/31/00	7.7	7.7	7.2	6.9	7.9	ND
1/20/00	8.1	8.1	8.3	8.9	8.6	8.4
2/16/00	8.0	7.9	8.1	7.8	7.9	7.9

Table E-3. TCLP Analysis of the Mill Process Sludge

WASTE ANALYSIS TOXICITY CHARACTERISTIC LEACHING PROCEDURE					
Cell/Sludge - 05/20/1991					
Metals	CAS No.	Regulatory Limit, mg/l	Minimum Reporting Limit, mg/l	Uncorrected for Spike Recovery Result, mg/l in Extract	Corrected for Spike Recovery Result, mg/l in Extract
Arsenic	7440-38-2	5.0	0.5	4.2	4.3
Barium	7440-39-3	100.0	10.0	<10	<10
Cadmium	7440-43-9	1.0	0.1	<0.1	<0.1
Chromium	7440-47-3	5.0	0.5	<0.5	<0.5
Lead	7439-92-1	5.0	0.5	<0.5	<0.5
Mercury	7439-97-6	0.2	0.02	<0.02	<0.02
Selenium	7782-49-2	1.0	0.1	<0.1	<0.1
Silver	7440-22-4	5.0	0.5	<0.5	<0.5
Process Pond Sludge - 04/20/1992					
Arsenic	7440-38-2	5.0	0.5	2.5	2.6
Barium	7440-39-3	100.0	10.0	<10	<10
Cadmium	7440-43-9	1.0	0.1	<0.1	<0.1
Chromium	7440-47-3	5.0	0.5	<0.5	<0.5
Lead	7439-92-1	5.0	0.5	<0.5	<0.5
Mercury	7439-97-6	0.2	0.02	<0.02	<0.02
Selenium	7782-49-2	1.0	0.1	<0.1	<0.1
Silver	7440-22-4	5.0	0.5	<0.5	<0.5
North Cell of Process Ponds - 08/26/1993					
Arsenic	7440-38-2	5.0	0.5	-	0.9
Barium	7440-39-3	100.0	10.0	-	<10
Cadmium	7440-43-9	1.0	0.1	-	<0.1
Chromium	7440-47-3	5.0	0.5	-	<0.5
Lead	7439-92-1	5.0	0.5	-	<0.5
Mercury	7439-97-6	0.2	0.02	-	<0.02
Selenium	7782-49-2	1.0	0.1	-	<0.1
Silver	7440-22-4	5.0	0.5	-	<0.5
Process Pond Sludge - 06/18/1997					
Arsenic	7440-38-2	5.0	0.5	-	<0.5
Barium	7440-39-3	100.0	10.0	-	<10
Cadmium	7440-43-9	1.0	0.1	-	<0.1
Chromium	7440-47-3	5.0	0.5	-	<0.5
Lead	7439-92-1	5.0	0.5	-	<0.5
Mercury	7439-97-6	0.2	0.02	-	<0.02
Selenium	7782-49-2	1.0	0.1	-	<0.1
Silver	7440-22-4	5.0	0.5	-	<0.5

**Table E-4. Results of Bench-scale Tests of the 4-Stage Biological Treatment System Operated for 188 Days**

Parameter	Seepage <sup>1</sup>	28 Days <sup>2</sup>	33 Days <sup>2</sup>	40 Days <sup>2</sup>	73 Days <sup>2</sup>	96 Days <sup>2</sup>	188 Days <sup>2</sup>
TDS	8,230	10,500	10,300	7,870	10,500	12,300	11,300
Calcium	592	870	696	788	856	842	789
CN-tot	0.26	0.08	0.05	0.03	0.10	0.06	0.11
NH <sub>3</sub> -N	63.2	77.8	54.8	57.9	72.9	86.4	118
NO <sub>3</sub> +NO <sub>2</sub> -N	<0.02	<0.02	0.02	0.04	0.03	0.75	0.02
Sulfate	3,220	4,730	4,390	4,120	4,620	4,490	4,660
Aluminum	0.157	0.046	<0.024	<0.12	0.10	0.29	0.09
Arsenic	6.9	0.272	0.211	0.154	0.152	0.182	0.170
Iron	101	0.13	0.07	<0.1	0.05	0.08	1.10
Manganese	9.61	7.57	5.98	6.99	6.0	5.6	7.1
Nickel	2.00	0.125	0.080	<0.12	0.05	0.06	0.01
Zinc	1.82	<0.003	<0.003	<0.015	0.001	0.013	0.038

Concentrations expressed in mg/L.

(1) Initial water quality shown is for seepage collected the final week in April 2000.

(2) Times shown are from the commencement of the test - April 28, 2000.

(3) TDS and sulfate measurements are for the initial shipment of water. The tests results shown are for treatment of subsequent water shipments and likely represent variable water quality.

(4) Manganese and ammonia concentrations are expected to decrease over a longer time interval as the required bacterial communities become more established.

Table E-5. Crevice Adit Water Quality

Parameter	Total recoverable metals			
	High Concentration (mg/l)	Low Concentration (mg/l)	Average Concentration (mg/l)	Montana Chronic Aquatic Standard (mg/l)
Calcium	32	28	30	NA
Potassium	5	5	5	NA
Sodium	13	12	12.5	NA
Magnesium	24	21	22.5	NA
Sulfate	19	18	18.5	250*
Chloride	1	<1	<1	230
Carbonate	<1	<1	<1	NA
Bicarbonate	227	224	225.5	NA
pH	8.3	8.0	8.15	6.5 to 8.5
Nitrate + Nitrite	0.02	0.01	0.015	10**
Arsenic	0.008	0.007	0.0075	0.018**
Cadmium	<0.0001	<0.0001	<0.0001	0.00143
Chromium	<0.001	<0.001	<0.001	0.210
Copper	0.001	<0.001	<0.001	0.0052
Iron	0.06	0.03	0.045	1.0
Lead	<0.001	<0.001	<0.001	0.0032
Selenium	<0.001	<0.001	<0.001	0.005
Silver	<0.003	<0.003	<0.003	0.0041***
Thallium	<0.003	<0.003	<0.003	0.0017**
Zinc	<0.01	<0.01	<0.01	0.067

\*EPA secondary drinking water standard

\*\*Human health standard

\*\*\*Acute, no chronic standard





## **APPENDIX F TO DRAFT EIS**

### **TVX MINERAL HILL MINE CONSOLIDATED CLOSURE PLAN**

#### **PUBLIC COMMENTS AND RESPONSES TO CLOSURE PLAN ALTERNATIVES AND DRAFT MPDES PERMIT**

On February 13, 2001, a Draft Environmental Impact Statement (EIS) for the TVX Mineral Hill Mine Consolidated Closure Plan was released for public review and comment. The Draft EIS was also published on the Montana Department of Environmental Quality (DEQ) web site. Copies of the Final EIS are being provided to about 131 persons, groups, local governments and agencies that have expressed an interest in the TVX Mineral Hill Mine Consolidated Closure Plan. The mailing list was compiled using the names and addresses of:

- ° Parties who participated in the public scoping meeting or submitted written comments;
- ° Parties who have requested copies of the EIS;
- ° Agencies, governments, and companies potentially affected by the proposed operations; and
- ° Agencies and groups consulted during EIS preparation.

The following agencies, organizations, and individuals received a copy of the Draft EIS:

#### **Federal Agencies**

- ° National Park Service, Yellowstone National Park
- ° US Environmental Protection Agency, Denver Office
- ° US Environmental Protection Agency, Montana Office
- ° US Fish and Wildlife Service
- ° USFS Gallatin National Forest, SO
- ° USFS Gardiner Ranger District
- ° USFS Region 1 Office

### **State Agencies**

- Montana Environmental Quality Council
- Montana Bureau of Mines & Geology
- Montana Department of Commerce,  
Building Codes Division
- Montana Department of Commerce,  
Hard Rock Mining Impact Board
- Montana Department of Environmental Quality,  
Air & Waste Management Bureau
- Montana Department of Environmental Quality,  
Water Protection Bureau
- Montana Fish, Wildlife and Parks
- Montana Department of Natural Resources & Conservation,  
Water Rights Bureau
- Montana Department of Transportation
- Montana State Historic Preservation Office
- Montana State Library
- Montana Tech Library
- Office of the Governor

### **Federal, State and Local Elected Officials**

- Mayor of Gardiner
- Park County Commissioners
- Montana State Representative Joe Balyeat
- Montana State Representative Bob Davies
- Montana State Representative John Esp
- Montana State Representative Cindy Younkin
- Montana State Senator Lorents Grosfield
- Montana State Senator Jack Wells
- Montana State Senator Don Hargrove
- US Representative Dennis R. Rehberg
- US Senator Max Baucus
- US Senator Conrad Burns

### **Organizations & Local Agencies**

- Bear Creek Council
- Gardiner Ambulance Service
- Gardiner Chamber of Commerce
- Gardiner Community Library
- Gardiner School District
- Greater Yellowstone Coalition
- Jardine TVX Mine Citizens Advisory Committee
- Livingston Chamber of Commerce
- Livingston School District
- Park County Sheriff's Department
- Upper Yellowstone Defense Fund
- Yellowstone Park Preservation Council

### **Other Interest Groups**

- Center for Science in Public Participation (CSP<sup>2</sup>)
- Montana Environmental Information Center
- Northern Plains Resource Council
- Mineral Policy Center
- Montana Mining Association
- Montana Wilderness Association
- National Wildlife Federation

### **Individuals & Businesses**

- An additional 80 individuals or businesses received a copy of the Final EIS.

To reach other parties that might be interested in the project and that were not on the mailing list, a legal notice was mailed to the Livingston Enterprise on February 9, 2001. The legal notice was published on February 13, 20, and 27, 2001. A press release was faxed to the Gardiner Chamber of Commerce Newsletter on March 6, 2001. The press release was also sent out electronically on February 15, 2001 to the State of Montana's Newslinks service, which is available free to any subscribers. The press release announced the issuance of the Draft EIS and announced an open house and formal public hearing to be held in Gardiner on March 7, 2001, at the Gardiner School Multipurpose Room. DEQ solicited public comments on the environmental analysis contained in the Draft EIS with the formal public comment period ending on March 20,

2001. Public comments were taken until April 20, 2001.

Twenty people attended the public hearing and four people formally commented on the TVX Mineral Hill Mine Consolidated Closure Plan. Thirteen letters and e-mail comments were received during the public comment period. The only commentor that was not local was the Environmental Protection Agency (EPA) office in Denver, CO.

TVX requested a bond release for reclamation work completed on the site in 2000 on December 12, 2000. DEQ calculated a draft reclamation bond for each alternative in the Draft EIS (see Table 3-7 in the Draft EIS) and included credit for work completed on the site in the calculations. On April 5, 2001, DEQ sent out a legal notice to the Livingston Enterprise, Bozeman Daily Chronicle and Billings Gazette and a press release was sent electronically to the State of Montana Newslinks service about a bond release hearing to be held on April 26, 2001 in Gardiner. DEQ will be accepting comments on the proposed bond release until May 7, 2001. DEQ will review the comments received at the bond release hearing and finalize the bond calculations for the preferred alternative closure plan. The final bond amount will be included in the Record of Decision.

The following section provides DEQ's responses to substantive public comments on the Draft EIS about the closure plan alternatives and the draft Montana Pollutant Discharge Elimination System (MPDES) permit. The comments are from the hearing, letters and e-mail received on the Draft EIS. The Public Comment is in the left column. DEQ's Response is in the right column. The public comment letters and e-mail and the transcript from the public hearing are printed in their entirety after the Comments and Responses section.

#### **TVX Mineral Hill Mine DEIS - Comments & Responses**

Comments	Response from DEQ
<p><b>JULIA PAGE HEARING COMMENTS</b> <b>March 7, 2001</b></p> <p>I am president now of Bear Creek Council. We have a little plan that I would start and then Bill and Richard and possibly George and possibly some others would speak later, so sorry for the shift. I'd like to say on the outset, we appreciate the work that the DEQ and TVX had done to give us an EIS on this closure plan, a Draft EIS at this point. I know there are some questions in the past when we felt that it took some effort to get both entities to commit</p>	

to doing an EIS and it is much more helpful for us to be able to see now in one document, this draft, a comprehensive look at the different things that would go into the different components of the cleanup. I think that we have an unusual opportunity with this mine and this mine has been an unusual mine in many respects. It started up and operated without a lot of the, there's a lot of controversy I think still regarding this mine, but this mine did a pretty competent job, I think people agree, in terms of keeping the area clean where they worked and protecting water quality as they did it, of staying in touch with the communities so the community knew what was going on and I think that was very helpful and now, as we face closure and this has been a quicker process from start to finish than many anticipated would happen.

But as we face closure, we have a chance to actually start, operate and finish a mine in good order and if that can happen and we can complete this process I would think this is something that we can all be proud of and it is something that has not happened enough in Montana and really needs to happen more in Montana if we are going to have, if mining is going to be part of the state, at least in my mind, this is what you want to see. This mine has gone through a number of changes and operations since the initial operating plan was issued and so I think this is appropriate that we have a comprehensive look at the closure now.

I think we have, at Bear Creek Council, we have several main concerns: water quality, I think being foremost, really, and is this closure plan addressing issues that need to be and competently addressing these issues. Richard is going to speak more about that.

**Page Comment 1: Revegetation Plan**

The revegetation plan, is that going to work? And how is that going to function? And then many other issues that go with this. Those are the two big broad issues.

**Response:** The applicant's proposed revegetation plan is described in the Consolidated Closure Plan and summarized in the Draft EIS (p. 11, Applicant's Proposed Plan, Revegetation). The applicant's proposed revegetation plan is analyzed in **Chapter 3** (p. 33-37, Applicant's Proposed Plan, Revegetation). DEQ has modified the Applicant's Proposed Plan based on recommendations by a revegetation specialist (Producers 2000 in **Appendix B**) (p. 36, Agency Modified Plan).

In the Agency Modified Plan, TVX must hire a revegetation specialist to review recent research by Producers. The revegetation specialist would modify the revegetation plan to ensure that Douglas fir can successfully establish and grow on the tailings storage facility (TSF) (p. 37, Agency Modified Plan).

DEQ is convinced that the benefits of dominance by trees and shrubs on the TSF in terms of reducing seepage over time is greater than the risk of trees being blown over and creating root wad divots on the reclaimed surface (p. 37, Agency Modified Plan). The revegetation specialist would recommend monitoring needed to ensure the revegetation plan is performing as designed. Noxious weeds would also be monitored and controlled (p. 37, Agency Modified Plan).

**Page Comment 2: Future Land Use Mining Potential**

And then the future land use concerns everybody. What will happen to this property once the closure is complete and TVX would like to leave. TVX would like to move on and they would like to go on to their next venture. And that concerns me a lot. The closure plan

**Response:** The US Forest Service (USFS) is a cooperating agency in this EIS. The USFS is reviewing the proposals and impacts outlined in the EIS for purposes of assessing any impact the closure plans may have on its potential future ownership and

refers to the desire to have the Forest Service take over this property. I think in the community, we at Bear Creek Council are in favor of that. We do not want to see subdivision happen up there. We do not want to see commercial development. Turning it over to the Forest Service, there was alluded to some, vaguely alluded to, that this would not be subject to the 1872 mining law. I wish that we could have more firm commitment to or understanding what that means in terms of the future use of the property. Is it available to mining? Can we actually have a stipulation that says no, it will not be opened to leasing or something like that? If that were a possibility, we would like to see that included in the Forest Service and the company statement. So that concerns us a great deal and I think it is vague now as to what will happen there.

management of the site. However, this EIS only considers the state action required to modify certain aspects of the approved closure plan and associated MPDES permit. This EIS does not consider the consequences of any federal action. The existing approved closure plan contemplates wildlife habitat and water quality protection as post-mining land uses. The proposed revisions contained in the Applicant's Proposed Plan and the Agency Modified Plan do not change these post-mining land uses. The EIS describes the impact on issues such as bonding, should the property transfer to the USFS (p. 43, Agency Modified Plan).

If the USFS assumes the ownership of the property, residential subdivision or commercial development would not be a possibility in the future (p. 30, Applicant's Proposed Plan).

As long as an operating permit is in place for the mine site, TVX could propose a land use change to residential subdivision or commercial development for all or part of the property and DEQ would have to analyze the environmental impacts of that land use change. The Metal Mine Reclamation Act (MMRA) does not preclude the potential use of a mine site for subdivisions or commercial development. Once reclaimed, the private property would continue to belong to TVX, and it can be disposed of according to their private property rights.

Once the reclamation bond is released on an operating permit, the landowner can do anything he wants with the private property, including subdivision or commercial development, as long as the landowner complies with other State of Montana regulations (see language added to p. 30 of the Draft EIS in **Appendix E**).



	<p>The laws under which the land would be donated to the USFS would preclude claim staking and mining under the 1872 mining law (see language added to p. 31 of the Draft EIS in <b>Appendix E</b>).</p> <p>DEQ regulates the MMRA and its associated rules and regulations. The operating permit holder proposes a post-mine land use and DEQ analyzes the proposed reclamation plan to ensure it would provide for that use. DEQ does not believe it can require a specific post-mine land use. This would restrict the potential use of private property and could be considered a takings. This restriction on post-mine land uses would have to be a voluntary commitment by TVX.</p> <p>In addition, the Montana Environmental Policy Act (MEPA) requires DEQ to evaluate any proposed regulatory restrictions on the use of private property. This evaluation of regulatory restrictions must include a discussion of whether alternatives have been analyzed that reduce, minimize or eliminate the regulation of private property rights. DEQ has not imposed anything on TVX that would restrict the use of its private property.</p> <p>The USFS is a cooperator on preparation of this EIS. Your comments have been forwarded to USFS reviewers. It is premature to state under what authorities the USFS might acquire the properties. The acquisition authority would determine the manner and extent to which National Environmental Policy Act (NEPA) would apply.</p>
<p><b>Page Comment 3: Potential Liability if USFS Assumes Ownership</b></p> <p>I think something that would possibly and when you contemplate the Forest Service</p>	<p><b>Response:</b> The USFS is very aware of the liabilities and costs associated with accepting</p>

taking this over, I think a concern of theirs would be, is the work done on the property well enough so that the property can be taken over and it doesn't hold the liability for whoever the subsequent landowner is.

the property from TVX. The land transfer agreement would identify the level of work needed to be done on the property before the USFS would accept it.

The USFS is a cooperator in this state EIS because of their interest in reclamation activities and the potential liabilities should they eventually accept the land. This State of Montana EIS is not considering the potential action by the USFS to accept the land. That is, no decision by the USFS has been analyzed in this EIS. However, the possibility of the property transfer is discussed in this EIS as to how it would impact future use by the USFS (p. 30 and 31, Applicant's Proposed Plan).

The USFS has been using the DEQ detailed draft bond calculations to estimate future operation and maintenance costs. The USFS would evaluate whether the property is worth accepting with the attached liability for continued operation and maintenance. DEQ believes if the land transfer to the USFS is approved, then DEQ would administratively have no choice but to release the bond back to TVX (see language added to p. 43 of the Draft EIS in **Appendix E**).

**Page Comment 4: Annual and Total Bond Costs for Reclamation and Water Treatment**

I am quite sure that the Forest Service would be on the lookout for future liability and I am not sure what they would think of an ongoing cost, for instance, to maintain the water treatment facilities. I would like to see in the closure plan some kind of an estimate as to the operating cost for operating, maintaining and monitoring on the water quality aspects of the mine and that would be good. I would assume that it is somewhat tied in with the bonding, but just an estimate of the annual cost, I think this would be helpful for us to

**Response:** A draft estimate of the bond for water treatment costs (\$6,419,000) was included in the Draft EIS (p. 44, Agency Modified Plan and in Table 3-7). The final draft bond for water treatment costs are \$5,189,000. This bond includes the costs of operating and maintaining the water treatment facilities. The draft bond calculations on water treatment detailing the various costs were sent to the Bear Creek Council by DEQ (12 pages). The final draft annual direct costs for operation and

<p>know.</p>	<p>maintenance of the water treatment systems are estimated at over \$105,000. The annual indirect costs would be over \$24,000. See the final draft bond calculations in Table E-1 in <b>Appendix E</b>.</p>
<p><b>Page Comment 5: 100-Year Bond Rationale</b></p> <p>In terms of the bonding, I am glad to see that the bonding is now calculated for a hundred years of water treatment, which is I gather is as far out as the department goes.</p>	<p><b>Response:</b> DEQ assumed a 3 percent inflation rate and 6 percent interest or discount rate based on current economic conditions. The operation, maintenance, capital and replacement costs were estimated based on a 100-year economic model. Less than 0.3 percent of the inflated costs must be invested today to pay bills 100 years from now at an interest rate of 6 percent (see language added to p. 40 of the Draft EIS in <b>Appendix E</b>).</p>
<p><b>Page Comment 6: Bond In FEIS and Public Comment Process on Bond Release</b></p> <p>And so that is good and it is contemplated to be adequate to provide the annual funds to operate this plan, so it seems like a good idea. I would like to see incorporated into the final document so it is available and we can know it, what bonding amounts are proposed for the water treatment and what are the separate amounts that are for the actual reclamation work, so that if the company comes back and wants to get some of their bond back, we would be able to anticipate what that would be for and why, because as I understand it when a bond is released, there would be a public hearing and you would get to comment. Do we think the work has been completed adequately? And the public has a chance at that. And I think if we had some kind of idea up front what we were looking at for that schedule, that would be good.</p>	<p><b>Response:</b> The final draft bond has been calculated for the Agency Modified Plan and totals \$3,280,000 for reclamation and \$5,189,000 for water treatment based on comments received on the Draft EIS (see the final draft bond calculations in Table E-1 in <b>Appendix E</b>). The final bond calculation for the preferred alternative would be in the Record of Decision (see language added to p. 40 of Draft EIS in <b>Appendix E</b>).</p> <p>Normally, before a bond can be released, any affected party can request a contested case hearing under the Montana Administrative Procedure Act. However, DEQ believes if the land transfer is approved, then DEQ would administratively have no choice but to release the bond back to TVX (see language added to p. 43 of the Draft EIS in <b>Appendix E</b>).</p>

	<p>The USFS is a cooperator on this EIS. Your concerns have been shared with the USFS reviewers.</p>
<p><b>Page Comment 7: 2-Year Reclamation Schedule</b></p> <p>I think that is basically all I want to say here. Others are going to speak to some of the other issues that we discussed. We are going to submit some written comments by the deadline and we very much appreciate being able to be here and comment on this plan now and see this plan and look at it and try and digest it.</p> <p>Another question is and has been raised is, there is somewhere in the law a 2-year time frame for the completion of reclamation. It is still unclear to me what that time frame applies to. And now we are in a process, it took about a year to get this draft out, there will be and I think you are going to go through that timetable. I am curious as to when this 2-year time frame starts and what meaning it has. So thanks for the opportunity to comment on this.</p>	<p><b>Response:</b> The Metal Mine Reclamation Act requires reclamation to be completed within 2 years after completion or abandonment of a mine site disturbance (MMRA 82-4-336(3) and 341(4)(b), MCA). Mining stopped in 1996. TVX then tried to sell the property. Then TVX submitted a request for an amended closure plan. If the Consolidated Closure Plan had not been submitted by TVX, reclamation should have been completed by now. The review and analysis process for the Consolidated Closure Plan has delayed the implementation of the 2-year timeframe. DEQ believes the 2-year timeframe for reclamation work to be completed starts when a closure plan is approved in the Record of Decision. TVX would have 2 years to complete the reclamation work and construction of the water treatment facilities.</p> <p>DEQ has been told that TVX can complete all of the reclamation work and water treatment system construction in 2001. Of course, extensions could be granted if unforeseen situations develop like the fire closures in 2000 (see new language added to the Draft EIS in <b>Appendix A</b>, page A-9).</p>
<p><b>BILL EDWARDS HEARING COMMENTS</b> <b>March 7, 2001</b></p> <p>I am vice-president of the Bear Creek Council and my remarks are going to be confined primarily to the area of revegetation and of noxious weeds. I am a plant ecologist by training and I'd like to say first of all, again thank you for the opportunity to do this. I was</p>	

at the last meeting and I certainly appreciate the fact you are following through on a number of these comments that were made at the last meeting and I am sure you will follow through on the comments on this one as well.

In general, in terms of the various proposed plans, if you will, that are outlined in here, in general I am in favor of the Agency Modified Plan as I have seen it in here. And in some cases, that doesn't make much of a change on the Applicant's Proposed Plan. For those of you who are familiar with the proposal, I am talking about the Table 2-3 specifically Comparison of Impacts Among Alternatives and related to that. First of all, in the list of things I have here, I think a revegetation specialist does need to be hired to come in and to take a look at the proposed plans and what has been done thus far because some revegetation has already been done. But I think we can learn from what has been done already on the site and that a specialist can give some recommendations, which may help in the long run as far as the ecological succession is concerned on the site of the plants coming back, generally referred to this as a secondary succession after we had this initial disturbance that's occurred there.

**Edwards Comment 1: Revegetation Bond Costs per Acre and Use of Native Species**

I think the bonding which is mentioned in here initially was some \$800 per acre as I recall for the revegetation that has been suggested at \$2,500 per acre. And already, by some feed back from some experts that had looked at it, they've decided that the \$800 just isn't sufficient and I don't know if the \$2,500 is sufficient, but I would say that would be a minimum at least per acre as far as revegetation. Again, only the native species should be used here and in the original plan with some non-native species that was

**Response:** Based on agency policy and practice, the bond for revegetation and surface treatments (i.e. weed control) has been increased to \$2,500 per acre in 2000. DEQ believes that \$2,500 per acre for revegetation would adequately cover the cost of revegetation as proposed in the Agency Modified Plan. If the revegetation specialist identifies additional measures that are needed to ensure revegetation success and that would increase the cost, DEQ could add more bond at that time through

suggested. But I think the rationale behind that is fairly logical. I think most people can see if we can get native vegetation to come in because we are really looking at community development and it's not the individual species as much as it is the total community that's going to be developed ecologically there that is important and native species are what we really need to deal with. I also agree with the idea of having Doug fir, for instance, the seeds or seedlings taken from the immediate area because of the genotypic variation which can occur from place to place even among members of the same species. I used to illustrate to my students by saying, just look at humans and how much they vary over the surface of the planet. They are all the same species. So I think that is pretty important, too.

implementation of the MMRA Section 82-4-337. This section allows DEQ to modify the reclamation plan at any time if needed to comply with regulations (see language added to the Draft EIS on p. 40 in **Appendix E**).

The Agency Modified Plan contains a requirement for the applicant to hire a revegetation specialist (p. 37, Agency Modified Plan). The applicant has consented to this requirement, and DEQ has approved the individual working on the project.

The seed mix contained in the Consolidated Closure Plan (CCP) is composed almost exclusively of native species. Only 1 to 2 of the 15 to 16 species in the mixes are introduced species (p. 33, Applicant's Proposed Plan). The revegetation specialist is tasked to review the seed mix and seeding rate.

DEQ agrees that native species would be the best for revegetation of this site. DEQ would accept the seed mix recommendations of the revegetation specialist hired by TVX to review the revegetation plans (p. 39 Agency Modified Plan).

Reclamation performed by the applicant under the approved plan has included planting shrubs grown from locally collected seed including: 2,500 aspen, 315 snowberry, 310 gooseberry, 98 woods rose, 2,000 rabbitbrush, 6,000 big sagebrush, and 530 willow. A total of 2,500 Douglas fir tubelings were acquired from seed stock collected from a similar climatic zone in Montana for planting in 2000. Another 10,000 Douglas fir tubelings have been reserved from seed collected on the mine site for planting during 2001.

DEQ would have the revegetation specialist make native species recommendations and

	<p>would ensure that TVX plants Douglas fir and other species of woody plants from local collections (see language added to p. 39 of the Draft EIS in <b>Appendix E</b>).</p>
<p><b>Edwards Comment 2: Organic Amendments Noxious Weeds and Seeding Rate</b></p> <p>I also need the proper organic material added, if we're going to add organic material because we can introduce a lot of foreign seeds and noxious weeds seeds if you don't use the proper mix there. Also, the seed mix needs to be I think, modified somewhat, I think, initially there were too many seeds per acre suggested and that needs to be reduced a little bit.</p>	<p><b>Response:</b> DEQ agrees. The Agency Modified Plan would require a review by a revegetation specialist with experience with various organic amendments and the effects the amendments have on communities dominated by grasses versus woody plants. The revegetation specialist would also evaluate the potential for the organic amendments to aid in noxious weed establishment and dominance on the site (p. 39, Agency Modified Plan).</p> <p>Establishment of forested ecosystems is enhanced by a fungus dominated soil microfauna. Use of wood waste compost is recommended in trying to establish a forested plant community (p. 37, Agency Modified Plan). Bacteria dominate grassland soil microfauna. Grasses are favored when manure is used for compost (p. 34-35, Applicant's Proposed Plan).</p> <p>The revegetation specialist would also revise the seed mix to reduce the seeding rate but not jeopardize erosion control.</p>
<p><b>Edwards Comment 3: Length of Monitoring for Revegetation</b></p> <p>Monitoring of the vegetation at least for 3 years after the planting occurs, I think, is also important because we do have quite a variation from year to year in a climatic regimes here and so we do need to look at that over several years period of time and to monitor during that time and hopefully the</p>	<p><b>Response:</b> The applicant has committed to revegetation monitoring (p. 27, Applicant's Proposed Plan). DEQ has expanded on this general commitment (p. 28, Agency Modified Plan). DEQ would require TVX to implement the revegetation monitoring recommended by the revegetation specialist (p. 39, Agency</p>



revegetation plan will take into consideration that if some changes need to be made or reseeding needs to be done in these areas, it should be done then. And I think that should be part of the final plan.

With that I think I probably used up more than my 4 minutes, but I appreciate, again, the opportunity and I will be looking forward to our next meeting when we can see what's going on with the revegetation plan and the noxious weed plan. Thank you.

**RICHARD PARKS WRITTEN HEARING  
COMMENTS**

**March 7, 2001**

I own and operate a sporting goods store and fishing outfitting service here in Gardiner. Obviously, my interests are tightly bound up with the quality of the water in the Yellowstone River and its tributaries. I appear this evening on my own behalf and as a member of Bear Creek Council, the local affiliate of the Northern Plains Resource Council.

First, let me thank the folks from the department and Amerikanuak for the work that went into preparing the document we have before us. It is a vast improvement over where we were 2 years ago and a considerable advance over the confusion that reigned just about a year ago when the scoping process was initiated. Along the way, the plan itself has obviously matured. Early ideas for water handling that couldn't pass the giggle test have been dropped and we appreciate that.

In reading the draft EIS from the perspective of water quality issues we can identify three remaining areas of concern. These are as follows:

Modified Plan). DEQ believes the minimum revegetation monitoring for revegetation communities dominated by woody plants would be at least 5 years. Noxious weed monitoring would also continue for the same period (see language added to p. 39 of the Draft EIS in **Appendix E**).

**Parks Comment 1: Other Areas Where TSF Treatment System has Been Used And Potential Winter Ice-Buildup**

First: I cannot find in the draft any references to operational systems similar to the one proposed to treat the effluent draining from the Tailings Storage Facility. There is, therefore, no data presented that assures the department or the public that the artificial wetland treatment stage will work through the 6 months or so of non-growing season, some of it under very harsh winter conditions. It is not hard to postulate some failure scenarios. For instance – at present the TSF is discharging about 2 gpm, the plan expects under 1 gpm during operation so lets just say 1/2 gpm – that gives us a contaminated iceberg containing 130,000 gallons of effluent. Will the "HDS" system contain this? Will this block of ice degrade the survivability or effectiveness of the HDS during the summer season? Are there appropriately comparable operational systems that can be referenced in the final EIS to assure us that the answers to these questions are positive and if so, will you cite them?

**Response:** The Consolidated Closure Plan in sub-appendices to Appendix 8 cites a limited number of other locations where the biological treatment system chemistry proposed at TVX for the TSF has been tested: (1) Shepherd Miller, Inc. 2000. "Treatment and Disposal of Mineral Hill Mine Tailings Storage Facility Effluent". Technical Memorandum SMI3100639, October 4, 2000, 2 pages plus attached 11-page report with Tables and Figures; and 2) Knight Piesold 1999. "TVX Mineral Hill Mine Site Treatment of Tailings Storage Facility Underliner Effluent Conceptual Passive Treatment System Design and Basis", 11-page letter and attached Tables and Figures (see language added to p. 9 of the Draft EIS in **Appendix E**). DEQ believes the system would work at TVX.

The TSF biological treatment system is designed to be a zero discharge system (p. 17, Applicant's Proposed Plan, Cap Design). That is, under normal conditions, there would be little or no discharge to the wet meadow habitat development site (HDS), especially in the winter. The Applicant's Proposed Plan anticipates the cap would reduce seepage from the TSF in winter to zero (p. 19-20 Seepage Quantity and Seepage Quality). During the first 2 years, as the TSF vegetation develops, DEQ would bond for continued reverse osmosis (RO) treatment as an additional contingency (p. 42, Applicant's Proposed Plan). TVX has estimated that it would take only 6 months to reach the performance goal of 1 gallon per minute (gpm) of seepage from the TSF.

DEQ does not anticipate ice accumulation problems in the wet meadow HDS. Should seepage continue during winter, it would accumulate in the soils of the wet meadow where it can be pumped to the upland HDS for distribution to the 6-foot deep infiltrator system. Soil storage is adequate to retain this water in the soil for spring and summer evapotranspiration. If, in a wet year, the flow did freeze and could not be pumped to the upland HDS for disposal, the 0.5-acre, 8-foot deep, triple-lined, wet meadow HDS would hold the total flow for the entire winter. The wet meadow and upland HDS systems could then treat the flow in the following spring and summer (see language added to p. 20 of the Draft EIS in **Appendix E**).

The company has designed the biological treatment system with internal redundancy, such that one set of vaults can be shut down for repairs, while maintaining system operation.

The company has proposed a contingency upland HDS system with two emitter systems, one deep and one shallow in case of a discharge out of the wet meadow HDS system (p. 9, TSF Seepage Management). The deep emitter system in the upland HDS would distribute winter overflow from the wet meadow HDS to the soil. The deep emitters in the upland HDS system would only be used as a contingency in the winter if the wet meadow HDS overflows in wet years. This water would only be applied after sufficient mixing with Crevice Adit water to ensure groundwater standards are met. This use of the deep emitters in the winter would be the only potential time that water could escape the root system of plants.

In addition, DEQ has developed two contingency plans in case the treatment system is down for repair or maintenance (p. 21, Agency Modified Plan). The upland HDS

	<p>system has been incorporated into a DEQ contingency plan to mix semi-treated effluent with Crevice Adit water in the event the TSF seepage does not meet groundwater standards or the treatment system requires repairs or maintenance (see Figure 1 in <b>Appendix D</b> of the Draft EIS).</p>
<p><b>Parks Comment 2: Sulfate and Potential Acid Drainage from TSF</b></p> <p>Second: Looking at Table 3-1 and Figure 3-4 raises questions about the effectiveness of the whole TSF treatment system in the removal of sulfates. SO<sub>4</sub> can easily turn into sulfuric acid with consequent pH problems in any receiving water and/or metals leaching. There seems to be very little room between the predicted performance of the system as revealed in these tables and compliance with water quality standards. What assurance does the department and the public have that any effluent from the HDS will consistently meet standards?</p>	<p><b>Response:</b> Currently, TSF seepage contains 3,100 milligrams per liter (mg/L) sulfate and the pH is 6.1 standard units (s.u.). DEQ reported TSF seepage contains an average of 2,872 mg/L sulfate and the pH is an average of 6.9 s.u. in Table 3.1 in the DEIS.</p> <p>Water quality in and around the historic old tailings in the TVX Mineral Hill Mine area was sampled as a surrogate to predict potential future water quality from the TSF tailings. Water quality in and immediately below the Old Tailings South (OTS) tailings pond was sampled and contained an average of 558 mg/L sulfate and the pH was between 7.0 and 9.0 s.u. These samples showed no pH reduction or other signs of ARD.</p> <p>Local groundwater was also sampled in the alluvium below the historic Old Tailings North (OTN) area after the OTN area was reclaimed in 1996. Water quality in 9 wells was sampled from April 1997 to December 1999 (see Maxim 2000. "1999 Water Monitoring Resources Report For The Old Tailings North Site. Mineral Hill Mine, Park County Montana". April 2000, in <b>Appendix E-1</b> attached to <b>Appendix E</b> in the Draft EIS). The groundwater in the 9 wells sampled contained pH values ranging from 4.58-8.08 s.u.</p> <p>Lysimeter data were collected from 6 lysimeters in the OTS tailings in January,</p>

February and March 2000. The lysimeter data showed the pH ranged from 6.9-8.9 (see Table E-2 in the Draft EIS in **Appendix E**). The lysimeters were completed at the base of the tailings deposit and in the soils immediately underlying the tailings. Samples were also collected from the unsaturated tailings. DEQ does not believe the limited long-term seepage from the reclaimed TSF would be worse than the OTS lysimeter water quality. The OTS tailings have been in place and weathering in an unreclaimed state for over 50 years.

The water quality in the TSF would change slowly over time because of the reclamation cap that would be placed on the tailings and the predicted low seepage rates. The biological treatment system can be changed as needed over time to address the changing water quality. DEQ would bond to cover annual operation and maintenance costs for the systems. This bond includes costs for professional services of over \$4,000 per year to cover costs associated with any system redesign needed.

Sulfate does not have a numeric water quality standard. Sulfate has a secondary drinking water standard of 250 mg/L. This standard is used as a general guidance for what sulfate concentrations should not exceed. Sulfate levels in the TSF seepage could be a problem if the seepage was proposed for a discharge.

The formation of sulfate minerals, particularly iron sulfate minerals, can aid in the acid generation process. However, it is thermodynamically unfavorable for sulfate to turn back into sulfuric acid. Sulfate will redissolve, although not easily, in very low pH environments.

	<p>The biological treatment system is designed to treat the TSF seepage and would raise the pH and drop some of the sulfate out as sulfides (p. 9, Applicant's Proposed Plan, TSF Seepage Management). Sulfate in the biological treatment system effluent reporting to the wet meadow HDS would exceed groundwater standards (Figure 3-4 in Draft EIS). Sulfate salt buildup may occur and DEQ would bond for replacement of TSF treatment system components as part of the bond calculations. This bond money could be used to replace the wet meadow HDS soils if needed sometime in the future.</p> <p>DEQ has required that TVX hire a revegetation specialist to review the revegetation plan to ensure that the TSF is dominated by woody plants to use up the water in the growth medium and limit seepage in the long term (p. 39, Agency Modified Plan).</p> <p>The TSF seepage treatment system is designed as a zero discharge facility. Any seepage that escapes the TSF underliner would be treated by the biological treatment and HDS systems proposed by TVX (p. 9, Applicant's Proposed Plan). The partially treated water would be used up by plants in the wet meadow HDS most of the time. When the wet meadow HDS overflows in wet years, the upland HDS would be used (p. 20, Applicant's Proposed Plan, Seepage Quality). The water entering the upland HDS would be diluted with Crevice Adit water to ensure it meets groundwater standards before it is applied to the HDS system (p. 20, Applicant's Proposed Plan). These contingencies and the additional monitoring required by DEQ (p. 21, Agency Modified Plan) would ensure groundwater or surface water standards are met even if the limited seepage turns more acidic over time.</p>
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**Parks Comment 4: Outfall 006 Contingency Impacts**

While the proposal provides for dilution of HDS discharges with clean water from the Crevice Adit that raises some other questions. Does this mean that the ephemeral drainage below the TSF will become a perennial stream, and if so, what are the consequences of that and are we certain that it will meet water quality standards?

**Response:** Overflow from the wet meadow HDS is only expected in wet years which is estimated to be 1 year in 20 years. The contingency to use the ephemeral drainage below the TSF to discharge partially treated TSF seepage mixed with Crevice Adit water would only be used when the biological treatment system is down for repair and maintenance (p. 21, Agency Modified Plan). The Draft EIS also states that if this contingency is ever needed, then the MPDES would have to be modified (p. 21, Agency Modified Plan). At that time the impacts to the ephemeral drainage would be analyzed. The ephemeral drainage would remain ephemeral even if the MPDES permit is modified and Outfall 006 is permitted (see language added to the Final MPDES permit in **Appendix E** about notification if the contingencies are used).

**Parks Comment 5: DEIS Assumes USFS is Ultimate Owner**

Third: This CCP assumes that the Forest Service is the final owner of the property.

**Response:** DEQ disagrees. The Draft EIS analyzed the impacts of the reclamation plan assuming that TVX would continue to be the owner and the final draft bond was calculated accordingly (see language added to p. 2 of the Draft EIS in **Appendix E**).

The USFS is a cooperator in this State of Montana EIS because of their interest in reclamation activities and the potential liabilities should they eventually accept the land. This State of Montana EIS is not considering the potential action by the USFS to accept the land (p. 2, Agencies' Roles and Responsibilities). That is, no decision by the USFS has been analyzed in this EIS. However, the possibility of the property



	<p>transfer is discussed in this EIS as to how it would impact future use by the USFS (p. 30 and 31, Applicant's Proposed Plan). The Draft EIS only considered what impacts the Applicant's Proposed Plan would have on the <u>potential</u> future use by the USFS. DEQ must assume there is no guarantee that the lands would be transferred to the USFS (see language added to p. 2 of the Draft EIS in <b>Appendix E</b>).</p>
<p><b>Parks Comment 6: Liability Associated with USFS Assuming Ownership, Funding Mechanism and Release of TVX Bond</b></p> <p>The reclamation work is supposed to assure them that, in taking the property, they are not taking on a large liability. Being a government agency, the USFS is not required to post a bond and this plan contemplates releasing TVX from its bond once the property is transferred. From the point of view of water quality, this seems potentially optimistic. At the same time, the community has an interest in the long-term management of the property, particularly in how the historic and natural resources of the area can contribute to the local economy. The CCP clearly anticipates that there are long-term operating costs associated with the water treatment systems. These costs would become an obligation of the USFS, or other successor to TVX, but no mechanism is identified to fund these costs. Will the Final EIS identify such a system? If not, will it commit DEQ, TVX, the public, and USFS to a process to identify and establish such a fund?</p>	<p><b>Response:</b> DEQ agrees that the MMRA does not require bonds for government agencies (ARM 17.24.101). The USFS is very aware of the liabilities and costs associated with accepting the property from TVX. The land transfer agreement would identify the level of work needed to be done on the property before the USFS would accept it.</p> <p>Normally, before a bond can be released, any affected party can request a contested case hearing under the Montana Administrative Procedure Act. If the land transfer to the USFS is approved, then DEQ would administratively have no choice but to release the bond back to TVX (see language added to p. 43 of the Draft EIS in <b>Appendix E</b>).</p> <p>The USFS is a cooperator on this EIS. Your concerns have been shared with the USFS reviewers.</p> <p>The USFS has been using the DEQ detailed draft bond calculations to estimate future operation and maintenance costs. The USFS would evaluate whether the property is worth accepting with the attached liability for continued operation and maintenance.</p>

	<p>Should the property be transferred, funding for operation and maintenance might require a congressional appropriation.</p> <p>The TVX property is potentially a valuable property for the US government to own because of its proximity to Yellowstone National Park and the wilderness, and its wildlife, scenic, and historic resource values.</p>
<p><b>MIRIAM SKERTICH HEARING COMMENTS</b>  <b>March 7, 2001</b></p> <p><b>Skertich Hearing Comment 1: Reclamation of the Mill Site</b></p> <p>I am Miriam Skertich and I am a resident in Jardine. There might have been something in the EIS, but I never found it and I am curious about what the plans are for the cleanup of the mill area, the area around the mill, the haul road leading from the mill to the tailings and underneath the mill. I want to make sure there is no acid-producing material left. Is the area going to be taken down several feet? I just don't know what the plans are. That was my question.</p>	<p><b>Response:</b> The issue of reclamation of the mill site was not considered in the Draft EIS because the reclamation plan for the site was not proposed for change. The mill facility is contained within a curbed concrete foundation. Floor sumps collected any spilled solutions and returned them to appropriate tanks. Only one spill is known to have escaped the concrete containment. On January 17, 1997, a spill of 4,388 gallons of ferric chloride occurred in the mill. This spill was contained within the concrete containment and cleaned up, with the exception of approximately 50 to 150 gallons, which were released from the mill. The impacted soils were removed for disposal. The maximum potential release to the environment was 150 gallons. The approved reclamation plan calls for breaking up the mill foundation concrete and for on-site burial. The mill and all its contents would be removed. Any contaminated materials in the mill would be removed from the site.</p> <p>TVX has committed to sample the mill area soils and if necessary the contaminated soil material would be buried in the mill area at least four feet deep to ensure they do not affect the reclaimed plant community (TVX</p>

	<p>letter to DEQ dated April 20, 2001). The mill area would be regraded and then covered with a minimum of 8 inches of soil and revegetated.</p> <p>The road from the mill to the tailings would be needed for future maintenance of the water treatment system at the TSF. The road would simply be partially reclaimed by reducing the width to 20 feet and ripping and soiling the rest of the road width.</p>
<p><b>MIRIAM AND WAYNE SKERTICH LETTER</b>  <b>Received March 19, 2001</b></p> <p><b>Skertich Comment 1: Exclusion of Skertich from Jardine Water System</b></p> <p>1. I asked Frank Bergstrom, at the last meeting, for information about the mine switching from the present Pine Creek water system to the new Jardine community water system. At a previous meeting we were told that we could hook up to the new system, at our expense. I was told now that we could not, that it is only for the mine. We are the only house on the east side of the creek not owned by the mine. It is in the historic district. Why are we excluded?</p>	<p><b>Response:</b> TVX has offered 50 gpm of the Crevice Adit water as a source for a continued public water supply and fire suppression system for the residents of the Jardine Historic District. TVX has proposed to construct a new groundwater source, potable water supply system for the Jardine Historic District (p. 10, Applicant's Proposed Plan). The system design would have to be approved by DEQ. To make use of that source, the local residents would have to organize into a Public Water Supply System (PWSS) entity that could operate and maintain the system in accordance with State of Montana requirements. TVX has never offered to operate and maintain the new PWSS for the benefit of Jardine Historic District residents (Frank Bergstrom, April 6, 2001. Personal Communication with Patrick Plantenberg, Helena, MT) (see language added to p. 23 of the Draft EIS in <b>Appendix E</b>).</p> <p>DEQ understands that TVX has stated others could potentially utilize the system in Jardine at their own expense. Business arrangements associated with expanding the</p>

	water system would be between the PWSS entity governing body and the private parties.
<p><b>Skertich Comment 2: Mill Area Reclamation</b></p> <p>2. We would like to know what plans are in place to ensure the cleanup of the area around and underneath the mill, when it is taken down. What kind of testing will be done to ensure that there is no acid generating material left?</p>	<p><b>Response:</b> See response to Miriam Skertich Hearing Comment 1 above.</p>
<p><b>JOE MCPHIE LETTER</b>  <b>Received March 15, 2001</b></p> <p><b>McPhie Comment 1: Crevice Adit Water System Design</b></p> <p>The water discharge from the Crevice Adit is exempt from nondegradation because the water comes from an exploration activity. I feel it is necessary for the DEQ to evaluate this exemption under the current status of the tunnel. While I was the Water Treatment Superintendent at Mineral Hill Mine, I received a legal opinion as to whether the water from the Crevice Adit would always enjoy an exemption from nondegradation. The opinion was that as long as the Crevice Adit remained an exploration activity, it would be exempt from nondegradation. If, however, the status of the tunnel changed from an exploration activity either by becoming part of the operating permit or by final reclamation, then the water flowing from the Crevice Adit would no longer be exempt from nondegradation. Apparently the intent of the law as passed by the legislation was that exploration activities were short duration so exempting them from nondegradation would not have long-term effects on water quality. It was never the intent of the legislature that this exemption would apply to long-term discharges. If the nondegradation exemption stands under your review this would set a precedent of once non-deg, always non-deg.</p>	<p><b>Response:</b> The Crevice Adit was permitted under an exploration license that included an approved reclamation plan (p. 21 and 22, Affected Environment). The EIS is considering changes to that plan as part of the Consolidated Closure Plan, but the authorization for the disturbance continues to be the exploration license and the exemption from nondegradation status of the discharge has not changed. The Crevice Adit discharge would be reduced approximately 50 percent through plugging decant holes (p. 22, Applicant's Proposed Plan). The water is of exceptionally high quality, and no treatment is necessary to meet all applicable water quality criteria (p. 23, Applicant's Proposed Plan) (see Table E-5 in <b>Appendix E</b>). DEQ contends that this discharge is not subject to nondegradation review because the discharge meets standards (p. 21, Affected Environment). The quality of the Crevice Adit water is similar to that which exists in Bear Creek. The Crevice Adit water, under no circumstances, would have to be of better quality than the receiving stream (75-5-306, MCA).</p>

**McPhie Comment 2: Freezing of Crevice Pipeline**

From the Draft EIS it [is] obvious the Crevice Adit will not have a hydraulic plug, but rather water will flow from the tunnel indefinitely. My concern is the almost flat profile of the Crevice Adit (0.3 percent from the portal to the intersection). The water will freeze if allowed to gravity flow. The water doesn't freeze now because it is pumped, but as anyone who has done plumbing in Montana knows, a 3.5" drop in 100 feet of pipe is grossly inadequate to keep the pipe from freezing if it flows by gravity. Since so much of the plan requires this water for dilution (if allowed), it is important that this water be available.

**Response:** DEQ appreciates the comment. DEQ and the USFS would review final designs for the pipeline systems and try to steepen the grade (p. 23, Agency Modified Plan). DEQ however, does not believe the grade would be a problem, since the HDPE pipeline would be buried from the inlet in the Crevice Adit sill to the outlet in Bear Creek. Burial would be at least six feet deep to avoid frost (p. 23, Applicant's Proposed Plan). Following construction, the pipe would be pressure tested for integrity (p. 23, Applicant's Proposed Plan). The SDR-11, HDPE pipeline has a long life and is anticipated to require little maintenance for the 100-year bonding period (p. 23, Agency Modified Plan). The pipeline would be built to drinking water standards. As extra insurance, DEQ would bond for operation and maintenance costs of \$20,000 per year and system component replacement costs of \$7,500 every 5 years in case of any problems (p. 9 and 10 of final draft Water Treatment detailed bond calculations).

**Tailings Storage Facility**

**McPhie Comment 3: TSF Nondegradation Requirements and TSF Treatment System Effectiveness**

The seepage quality of the TSF after the biological treatment system is still of concern to me. This water is required to meet nondegradation. There is no disputing this fact. The effluent referred to as semi-treated, doesn't even meet human health standards for arsenic and several other constituents. I was surprised that even before the draft EIS was issued, the DEQ had already given approval to construct the full-scale system even though

**Response:** The TSF biological treatment system is designed to be a zero discharge system (p. 17, Applicant's Proposed Plan, Cap Design). That is, under normal conditions, there would be little or no discharge to the wet meadow HDS. The company has proposed a contingency upland HDS system with two emitter systems, one deep and one shallow, in case of a discharge out of the wet meadow HDS

<p>this treatment has proven ineffective.</p>	<p>system (p. 9, TSF Seepage Management). The upland HDS system has been incorporated into a DEQ contingency plan to mix semi-treated effluent in the event the treatment system requires major maintenance (see Figure 1 in <b>Appendix D</b>). The company has designed the biological treatment system with internal redundancy, such that some tanks can be shut down for repairs, while maintaining system operation.</p> <p>DEQ has set the background arsenic standard for groundwater at Outfall 005 at 36 ppb, which is well above the bench scale, biological system effluent quality (Consolidated Closure Plan, Appendix C, p. C-FS-9). Therefore, only manganese and sulfate and consequently TDS, exceed applicable groundwater criteria. Pilot scale studies using a new limestone source material would determine if the manganese was an artifact of the local Gardiner travertine limestone source used in the bench scale study.</p> <p>DEQ does not believe the proposed system has been proven ineffective. DEQ has agreed to allow the system to be constructed to verify pilot scale studies results. The system as described in the Applicant's Proposed Plan (p. 20-21, Applicant's Proposed Plan) and the Agency Modified Plan (p. 21, Agency Modified Plan) complies with Montana nondegradation rules (<b>Appendix C</b> in DEIS).</p> <p>In addition, DEQ has developed two contingency plans in case the treatment system is down for repair or maintenance (p. 21, Agency Modified Plan).</p>

**McPhie Comment 4: Freezing of TSF Seepage in Wet Meadow HDS in Winter**

The wet meadow Habitat Development Site (HDS) is designed for total utilization of the water from the biological treatment system. My fear again is that during the winter, the HDS will be nothing more than a frozen mass of contaminated water which will flow uncontrolled during spring run off. This problem must be addressed.

**Response:** The Applicant's Proposed Plan anticipates the cap would reduce seepage from the TSF in winter to zero (p. 19-20 Seepage Quantity and Seepage Quality). During the first two years, as the TSF vegetation develops, DEQ would bond for continued RO treatment (p. 42, Applicant's Proposed Plan).

DEQ does not anticipate ice accumulation problems in the wet meadow HDS. The Applicant's Proposed Plan includes a deep emitter system in the upland HDS. The deep emitters in the upland HDS system would only be used as a contingency in the winter if the wet meadow HDS overflows in wet years. This water would only be applied after sufficient mixing with Crevice Adit water to ensure groundwater standards are met. This use of the deep emitters in the winter would be the only potential time that water could escape the root system of plants.

If, in a wet year, the wet meadow HDS overflow could not be pumped to the upland HDS system because the overflow froze, the 0.5-acre, 8-foot deep, triple-lined, wet meadow HDS would hold the total flow for the entire winter. The overflow could then be treated by the wet meadow and upland HDS system in the following spring and summer (see language added to p. 20 of the Draft EIS in **Appendix E**).

**McPhie Comment 5: Dilution of TSF Seepage with Crevice Adit Water**

Under the plan, if the HDS can not utilize all the effluent from the biological treatment system, then the effluent will be diluted with Crevice Adit water. Dilution is not the solution

**Response:** Currently, the seepage from the TSF is treated with RO and evaporation of the brines. The Applicant's Proposed Plan is



to pollution. More importantly, dilution is not treatment. I dealt with the DEQ on water quality issues, so it amazes me to see you propose dilution as a treatment. Since EPA does not allow dilution instead of treatment, I do not understand how the DEQ can propose this as a solution. This issue is not just a hand wringing, fussy concern on my part. The issue of dilution instead of treatment goes to the core of our water quality laws in this country. DEQ needs to address this in the final EIS. Please do not ignore this issue just because it comes from me.

designed as a zero discharge facility which includes the upland HDS as a contingency for higher seepage rates during wet periods (see McPhie Comment 4 above). DEQ has added two other contingencies in the event of major maintenance or temporary problems (p. 43, Agency Modified Plan). Mixing with Crevice Adit water is only proposed as a contingency in case other systems are down for repairs or maintenance or in wet years. These contingencies are not intended for continuous long-term operation, but provide additional layers of security to assure no environmental degradation can occur. Based on the bench scale treatment efficiency evidence, conservative evapotranspiration estimates, the large surface area of the 0.5 acre wet meadow and 1.7 acre upland HDS systems, duplicate emitter systems in the upland HDS, and two added contingencies in the Agency Modified Plan, DEQ has determined the TSF biological treatment system would successfully treat TSF seepage without depending on long-term dilution for compliance.

Dilution may not be used to achieve technology-based limits under 40 CFR. The limits in this MPDES permit are water quality based. Mixing of waste streams is not prohibited under 40 CFR. The original permit allowed the dilution of 1300 Adit water with Crevice Adit water to achieve standards in the same way as this permit renewal.

**McPhie Comment 6: Diluted Water Must Meet Nondegradation**

If the DEQ decides to allow dilution of the TSF effluent with Crevice Adit water, then the mixed stream must meet nondegradation. Again, there is no disputing this. If effluent water that must meet nondegradation is mixed with effluent water that is exempt from nondegradation, then the resulting flow must all meet nondegradation. This is not new information; I have been through this with the agency before.

**Response:** As discussed above, the system as designed would be permitted as a zero discharge facility (p. 9, Applicant's Proposed Plan). Contingencies are available in the event a problem is encountered. DEQ has added additional monitoring points to ensure the discharge meets groundwater standards before water leaves the mix-box to the upland HDS or from the wet meadow HDS to the ephemeral drainage below the wet meadow HDS (see Figure 1 in **Appendix D** in the Draft EIS).

If a discharge were anticipated through Outfall 006, the applicable standard, nondegradation standard, or background conditions would have to be met. Nondegradation would apply only to that portion of the discharge which was not in existence prior to April 29, 1993 or is considered exempt. The final MPDES permit has been modified to reflect this condition (see language added to the Fact Sheet, Section J, Contingency Plans in **Appendix E** and in **Appendix G**).

Bonding is proposed for the contingencies (p. 43, Agency Modified Plan).

**McPhie Comment 7: Outfall 006 is a Violation of Montana's Nondegradation Law**

The agency's comment that the standards for Outfall 006 would be the same as Outfall 001 is in violation of Montana's nondegradation law.

**Response:** Outfall 006 would not be in violation of the nondegradation law as long as the discharge met standards for Bear Creek. As stated in the previous response the applicable standard, nondegradation standard or the background condition would apply and the final MPDES permit has been so modified (see language added to Fact

	<p>Sheet, Section J, Contingency Plans in <b>Appendix E</b> and <b>Appendix G</b>). Outfall 006 is not being permitted at this time. It is only identified as a contingency (p. 43, Agency Modified Plan). If it is proposed, then the MPDES would have to be modified at that time and the issue addressed again. These contingencies were identified in the Draft EIS so that the water treatment systems could be constructed by TVX in case the property transferred to the USFS. If the outfall were needed in the future, the plumbing system would be in place and would have been paid for by TVX.</p>
<p><b>McPhie Comment 8: Dissolved and Total Recoverable Concentrations are Used Interchangeably in the Draft MPDES Permit</b></p> <p>In addition, dissolved concentrations and total recoverable concentrations are used interchangeably in the proposed permit. This must also be resolved.</p>	<p><b>Response:</b> DEQ has double-checked all numbers used in the draft MPDES permit in <b>Appendix C</b> of the Draft EIS. DEQ disagrees that dissolved and total recoverable concentrations are used interchangeably in the proposed permit. Total recoverable arsenic is appropriate for surface water discharges and dissolved arsenic is the appropriate criterion for ground water discharges (see DEQ, Water Quality Bureau's Circular WQB-7, Montana Numeric Water Quality Standards, September 1999, footnote 6).</p>
<p><b>1300 Adit Drainage</b></p> <p><b>McPhie Comment 9: A New Drain Field Should Be Used for the 1300 Adit Drainage</b></p> <p>Since treatment of the 1300 Adit Drainage is required, then I agree with the DEQ that monitoring of effluent is necessary. In addition, I feel it would make more sense to construct a separate drainfield for this effluent instead of using the existing septic drainfield. I see no reason to flush the nitrates from the</p>	<p><b>Response:</b> The existing drainfields were designed and built to serve the operating mine for up to 200 people (p. 24, Applicant's Proposed Plan). Following closure, only a few people would use the system. Adequate capacity would be available for infiltration of</p>

<p>existing drainfield, any faster than will occur naturally. A new drainfield is inexpensive and should work better than the existing one.</p>	<p>the 1300 Adit water. DEQ's review in the draft MPDES permit indicates that the use of the system should be protective of all applicable Montana water quality criteria (<b>Appendix C</b> in Draft EIS). Monitoring of groundwater under the operating permit, MPDES and the pending EPA Underground Injection Control (UIC) permit would indicate if nitrate trends are a problem downgradient of the drainfields.</p>
<p><b>McPhie Comment 10: EPA Proposed Arsenic Standard Effect on MPDES Permit</b></p> <p>Additionally, EPA is changing the human health standard for arsenic. Will this change affect the discharge permit for Mineral Hill?</p>	<p><b>Response:</b> See Allen Letter, Comment 11 and Allen E-mail, comment 1, below.</p>
<p><b>BOND</b></p> <p><b>McPhie Comment 11: Bond for Crevice Tunnel Rehabilitation</b></p> <p>I have one main issue that needs addressed under bonding. The Crevice Tunnel is well designed, and was constructed by some of the finest miners in the world. I should know; I was the Crevice Project Superintendent before the shutdown in 1996. That said, the Crevice Tunnel was not designed or constructed to remain standing beyond the design life of 10-15 years. Unlike civil tunnels, mine tunnels have a short design life. This is done primarily for economics, because it doesn't make sense to have a tunnel with a design life longer than the mine itself.</p> <p>Under the closure plan, the Crevice Tunnel will be used for ingress and egress of personnel for the next 100 years. Without extensive, ongoing maintenance the tunnel is unlikely to remain open for even the next 10 years. The first 200 feet of the tunnel goes through a large fault. This is why there are steel sets in that first section. In addition there are several</p>	<p><b>Response:</b> Thank you for your comment, DEQ has added some additional bond for periodic maintenance of the adit from rock collapse because of rock bolt failure etc. The additional bond has been added to the yearly operation and maintenance bond calculation.</p> <p>The pipeline would be built to drinking water standards. As extra insurance, DEQ would bond for operation and maintenance costs of \$20,000 per year and system component replacement costs of \$7,500 every 5 years. In addition, an estimated 10 percent blanket contingency bond is included for capital, operation and maintenance cost calculations to account for uncertainty.</p>

<p>smaller faults further in the tunnel. The ground is supported primarily by split set bolts. Because of wet conditions in the tunnel, these bolts will succumb to rust resulting in failure of the ground support system.</p> <p>There should be a bond in place for the complete rehabilitation of the tunnel every 10 years. In addition money should be set aside as insurance against a catastrophic failure as a result of seismic activity in the region. We know from experience that many of the tunnels collapsed in the Mineral Hill and Crevice district as a result of the 1959 Hebgen Quake. There is a good probability another quake of this magnitude could be expected in this area over the next 100 years.</p> <p>I realize this should have been covered during the EIS scoping, but I never imagined the DEQ would buy off on leaving the tunnel open rather than installing a hydraulic plug. But since TVX and DEQ seem set on leaving the tunnel open, then adequate bonding should be in place to cover this significant cost.</p>	
<p><b>Future Land Use</b></p> <p><b>McPhie Comment 12: Potential CERCLA and Other Liabilities</b></p> <p>I have concerns over TVX's proposal to "donate" Mineral Hill to the USFS. Believe me, nobody wants to see TVX leave our community, our state, and our country worse than I do. But I don't want to see them leave at the expense of the taxpayers. Regardless of how well the property was managed, there are environmental liabilities that currently exist. It is a fact that water treatment will continue indefinitely. There is CERCLA liability in connection with the tailings impoundment, and there is considerable maintenance that will be required.</p>	<p><b>Response:</b> The USFS is a cooperator in this State of Montana EIS because of its interest in reclamation activities and the potential liabilities should it eventually accept the land. This State of Montana EIS is not considering the potential approval of the land transfer. That is, no decision by the USFS has been analyzed in this EIS. However, the possibility of the property transfer is discussed in this EIS as to how it would impact state actions – specifically regarding the bond (p. 43, Applicant's Proposed Plan).</p>

	<p>The USFS has been using the DEQ detailed final draft bond calculations to estimate future operation and maintenance costs. The USFS would evaluate whether the property is worth accepting with the attached liability for continued operation and maintenance.</p> <p>DEQ believes if the land transfer to the USFS is approved, then DEQ would administratively have no choice but to release the bond back to TVX (see language added to p. 43 of the DEIS in <b>Appendix E</b>).</p> <p>The USFS is a cooperator on this EIS. Your concerns have been shared with the USFS reviewers.</p>
<p><b>McPhie Comment 13: Future Subdivision of Property</b></p> <p>The post-closure land use should not include residential subdivision. Even the hint that TVX might consider this option is irresponsible. The original EIS and the draft EIS both exclude residential subdivision as an option. Regardless of whether TVX retains ownership of the property or if the ownership is transferred to the USFS, residential subdivision should not be allowed.</p>	<p><b>Response:</b> If the USFS assumes the ownership of the property, residential subdivision would not be a possibility in the future. As long as an operating permit is in place for the mine site, TVX could propose a land use change to residential subdivision for all or part of the property and DEQ would have to analyze the environmental impacts of that land use change. The MMRA does not preclude the potential use of a mine site for subdivisions. Once the reclamation bond is released on an operating permit, the landowner can do anything he wants with the private property, including subdivision, as long as the landowner complies with other State of Montana regulations (see language added to p. 30 of the Draft EIS in <b>Appendix E</b>).</p>

**McPhie Comments 14: Land Transfer after 5 years of Monitoring and Preparation of EIS**

The land transfer should not take place until reclamation is completed and there are 5 years of post-closure monitoring by TVX. At that time the USFS should perform an EIS to determine the impact of the "donation" along with a complete environmental audit of the property. If the USFS decides to continue with the transfer, then TVX should donate the land and provide money for the treatment of water, monitoring, and on going maintenance in-perpetuity.

**Response:** The potential land transfer from TVX to the USFS would contain provisions that TVX must complete before the land can be transferred to public ownership and before the bond can be released.

The USFS is a cooperator on this EIS. Your concerns have been shared with the USFS reviewers. It is premature to state under what authorities the USFS might acquire the properties. The acquisition authority would determine the manner and extent to which NEPA would apply.

**STEPHEN MONNIGER LETTER**

**Received March 16, 2001**

**General Comments**

**Monninger Comment 1: EIS and CERCLA-Based on Audit Needed on Property Transfer to USFS**

A) I have grave concerns about TVX's plan to donate the MHM property to the Gallatin National Forest. It is my understanding that TVX has approached Montana's congressional leadership, the Governors Office, and local Park County officials to enlist their help to expedite the land transaction, including possible legislation. It is also my understanding that whenever a federal agency gets involved with a land exchange, sale, or donation it must, by law, generate an EIS and a CERCLA-based audit. By trying to legislate or otherwise expedite the transaction, the Forest Service may find themselves exempt from following established and lawful

**Response:** The USFS is very aware of the procedures required in such a process. It is premature to state under what authorities the USFS might acquire the properties. The acquisition authority would determine the manner and extent to which NEPA would apply. The USFS would conduct a CERCLA-based audit of the property. The USFS would have a list of very specific requirements that TVX must meet before the property could be transferred from TVX to the USFS. The USFS would develop a donation agreement that would specify the terms under which the property would be



<p>procedures. I am sure this is exactly what TVX is hoping for.</p>	<p>transferred.</p> <p>The USFS is a cooperator on this EIS. Your concerns have been shared with the USFS reviewers.</p>
<p><b>Monninger Comment 2: US Taxpayers Responsible for Monitoring and Maintenance of the Site</b></p> <p>What is more disturbing is the fact that by donating the property, TVX will be released from its bonding obligations. The Forest Service then becomes responsible for all the long-term monitoring and maintenance (M&amp;M) of the site. However, it is not the Forest Service who is ultimately responsible, but the tax-paying public who becomes responsible for the M &amp; M and all future liabilities. TVX and the Forest Service have three viable options as I see it:</p> <p>TVX can donate the property to the Forest Service along with a check for \$20 million to cover all future contingencies; TVX can donate the property to the Forest Service but honor all their stated commitments and bonding obligations; or the Forest Service should respectfully decline the whole deal if TVX will not offer 1 or 2.</p> <p>The motive for TVX proposing this idea should also be examined. TVX is not donating the property because they are a conscientious mining company and want the Forest Service to establish additional elk habitat. No, TVX simply wants to walk away from their bonding obligation. After this state has endured the Pegasus Gold fiasco and the Canyon Resources fiasco, its time a mining company holds itself accountable. Both Pegasus and Canyon have tried to ignore or minimize their accountability and obligations. Now TVX is trying to do the same thing. I imagine their response would be, "We have an obligation to</p>	<p><b>Response:</b> DEQ believes if the land transfer to the USFS is approved, then DEQ would administratively have no choice but to release the bond back to TVX (see language added to p. 43 of the Draft EIS in <b>Appendix E</b>).</p> <p>The USFS would evaluate whether the property is worth accepting with the attached liability for continued operation and maintenance. TVX would have to honor its reclamation obligations and construct the water treatment systems.</p> <p>The USFS is very aware of the liabilities and costs potentially associated with accepting the property from TVX. The USFS would develop a donation agreement that would specify the terms under which the property would be transferred.</p> <p>The USFS is a cooperator on this EIS. Your concerns have been shared with the USFS reviewers.</p>

<p>all three of our shareholders." They ignore the fact that they have an even greater obligation to Montana and Park County, not to mention the rest of the mining industry. This property is only 500 plus acres. 500 acres is not worth the headaches the Forest Service/public will inherit. It is elk habitat, but it's hardly on the scale of the Royal Teton Ranch transaction.</p>	
<p><b>Monninger Comment 3: Suspicious over EDYS Model</b></p> <p>B. The approved reclamation action for the TSF is based on the EDYS model. Since there is very little supporting data (e.g., calibration and sensitivity data) to confirm whether model assumptions and conclusions are correct, I guess the public has to take Shepherd-Miller's word. I have no doubt that the model is correct and a big improvement over the HELP Model, but I'm a little suspicious of a model that is proprietary to one consulting firm. The term, "self-serving" comes to mind.</p>	<p><b>Response:</b> DEQ appreciates your concern but the EDYS model has been used in many other areas of the western United States, including Yellowstone National Park. DEQ invited the author of the model to Helena to present a training session in June 2000 to develop a better understanding of the model. DEQ and USFS representatives attended the session.</p> <p>DEQ is concerned about long-term maintenance and function of the clay cap in the existing approved reclamation plan. In the case of the Mineral Hill Mine, the water balance cap design concept for the TSF is applicable (p. 17-19, Applicant's Proposed Plan). The EDYS model provides an excellent tool for sensitivity studies and comparisons between alternatives, as presented in this EIS. The capacity to compare relative differences of the alternatives is the most useful function of the model. Additionally, verification data from first-year test plots and 9-year old reclamation onsite provide excellent supporting information regarding the accuracy of the predictions (p. 34 and 35, Applicant's Proposed Plan). Based on this information, DEQ is confident in the utility of the EDYS model for comparing alternatives in this EIS. Monitoring of the revegetation would ensure the establishment and survival of Douglas fir and other woody plants on the</p>

	TSF.
<p><b>Monninger Comment 4: Detailed Monitoring and Maintenance Plan Needed</b></p> <p>C. Throughout the Draft EIS, there is very little information on TVX's Monitoring &amp; Maintenance Plan. General statements are made to the effect that M &amp; M will be part of the final reclamation plan and bonding will be done accordingly. However, there is not enough detail to ascertain if the M &amp; M Plan will be effective to ensure compliance with permit stipulations and to maintain the long-term integrity of the infrastructure (pipelines, pumps, etc.). It is clear that there will be a great deal of post-closure monitoring, water treatment, and maintenance of infrastructure. What is more disturbing is that TVX has stated all the M &amp; M tasks will be accomplished by one part-time employee (Issue 7, Applicant's Proposed Plan, page 30, 4<sup>th</sup> paragraph). The proposal to have one part-time employee hardly instills a sense [of] confidence that at 3:00 AM and 30 below a broken pipeline spilling water all over the place is being attended to. How can one part-time employee manage to be everywhere every time he/she is needed? What if the person wants to go see a movie or go on vacation? Let's get real.</p>	<p><b>Response:</b> The monitoring and maintenance plan is summarized in the Draft EIS (p. 27-29, Applicant's Proposed Plan and Agency Modified Plan). More details on the monitoring and maintenance requirements can be found in other documents. The applicant has included a hydrologic monitoring program in its Consolidated Closure Plan (CCP, Appendix 10). This plan is based on the existing operational hydrologic monitoring plan and has been updated in the CCP. The existing monitoring plan was previously analyzed under MEPA. Monitoring plans change over the years.</p> <p>The proposed MPDES monitoring plan was included in the Draft MPDES permit (<b>Appendix C</b> in DEIS). The MPDES monitoring plan was modified based on comments received on the Draft EIS (see language added to the final MPDES permit in <b>Appendix E</b> and <b>Appendix G</b>).</p> <p>The applicant has also presented a general revegetation monitoring plan (CCP, Appendix 10). DEQ has analyzed that plan, and as discussed in the EIS, included a requirement under the Agency Modified Plan for the applicant to retain a qualified revegetation professional to refine that plan (p. 28, Agency Modified Plan).</p> <p>The monitoring and maintenance information contained in the CCP is adequate for the purposes of this EIS. The monitoring program also includes inspections of civil works. The pipeline systems would be built to drinking water line specifications. DEQ has added requirements to review final designs for water treatment systems (p. 11,</p>

	<p>Agency Modified Plan).</p> <p>The detailed bond calculations include costs for annual monitoring and maintenance of facilities. DEQ has included a cost for an engineering design and management firm to help with maintenance of the property. DEQ has assumed a contractor would do all the water monitoring and reporting. DEQ has included professional services (i.e. consultants) to do annual maintenance work for the Monitoring Well (MW) 10 remediation system, TSF water system, 1300 Adit water system, Crevice Adit water system and the temporary RO water treatment system. DEQ believes that one part-time employee can do the routine maintenance after reclamation is completed. DEQ believes adequate bond has been calculated for all maintenance tasks (see Final Draft Bond Calculation in <b>Appendix E</b>, Table E-1).</p>
<p><b>Other M &amp; M issues include:</b></p> <p><b>Monninger Comment 5: Certified Operator Issue</b></p> <p>Maintaining a potable water system for Jardine will require a certified operator. Assuming that this part-time employee is certified, what happens when he/she decides to find work elsewhere? How will TVX address this situation?</p>	<p><b>Response:</b> TVX has offered the Crevice Adit water as a public water supply and fire suppression system source to the residents in the Jardine Historic District. TVX has proposed to construct a new groundwater source, potable water supply for the Jardine Historic District (p. 10, Applicant's Proposed Plan). The system design would have to be approved by DEQ. To make use of that source, the residents would have to organize into a Public Water Supply System (PWSS) entity that could operate and maintain their system in accordance with State of Montana requirements. TVX has never offered to operate and maintain the public water supply for the benefit of Jardine Historic District residents (Frank Bergstrom, April 6, 2001. Personal Communication with Patrick</p>

	<p>Plantenberg, Helena, MT) (see language added to p. 23 of the Draft EIS in <b>Appendix E</b>).</p> <p>Should the property remain in the hands of TVX, bond would be retained for maintenance activities and to cover the cost of one part-time employee. TVX would be responsible for maintaining compliance with its operating and MPDES permits. The PWSS entity would be responsible for maintaining compliance with its PWSS permit.</p> <p>If DEQ were to assume the permit in the event of a TVX bankruptcy, DEQ would be responsible for ensuring that the bond is held for professional services, engineering design and management and to pay for the part-time employee. DEQ would maintain the operating and MPDES permits.</p> <p>The PWSS governing body has to ensure the presence of a certified operator (see language added to p. 23 of the Draft EIS in <b>Appendix E</b>).</p>
<p><b>Monninger Comment 6: Chlorination of Jardine Water Supply Issue</b></p> <p>The EPA may promulgate regulations requiring primary treatment (chlorination) of potable water from underground sources. If this happens, how will TVX address this issue of new regulations or amendments to existing regulations?</p>	<p><b>Response:</b> TVX has proposed to construct a new groundwater source, potable water supply for the Jardine Historic District (p. 10, Applicant's Proposed Plan). DEQ feels this change would be beneficial to any future management of the property, especially if it were to be donated to the USFS (p. 23, Applicant's Proposed Plan). Potential regulatory changes to the Federal Safe Drinking Water Act and its implementing regulations are outside the scope of this EIS. DEQ is required to bond for conditions required at this time. Regardless of future ownership of the property by TVX, a bankruptcy trustee, or the USFS, if the</p>

	statutes change, the requirements would have to be addressed at that time.
<p><b>Monninger Comment 7: Winter Operation Logistics</b></p> <p>Operating water treatment and distribution systems in the winter is problematic at best. How can TVX ensure that all the right pumps and all the right valves are turned on/off at all the right times?</p>	<p><b>Response:</b> TVX is responsible for compliance with all regulations as long as it has the operating and MPDES permits.</p> <p>If TVX were to file for bankruptcy, then DEQ would be responsible for management of the site. The Applicant's Proposed Plan, which is further supplemented in the Agency Modified Plan, includes redundant low technology systems. Site maintenance requirements would be low, but DEQ would bond for regular inspections of all water treatment systems. A part-time employee would check on systems. An engineering firm would be retained to ensure that systems are operated properly. (Detailed bond calculations are available from DEQ Helena offices).</p> <p>If the USFS assumes ownership of the property, they would have to ensure proper operation and maintenance of the site water treatment systems.</p> <p>TVX offered 50 gpm of the Crevice Adit water as a public water supply and fire suppression system source to the residents in the Jardine Historic District. TVX has proposed to construct a new groundwater source, potable water supply for the Jardine Historic District residents (p. 10, Applicant's Proposed Plan). The system design would have to be approved by DEQ. To make use of that source, the residents would have to organize into a Public Water Supply System (PWSS) entity that could operate and maintain their system in accordance with State of Montana requirements. TVX has never offered to operate and maintain the</p>

	<p>public water supply for the benefit of Jardine Historic District residents (Frank Bergstrom, April 6, 2001. Personal Communication with Patrick Plantenberg, Helena, MT) (see language added to p. 23 of the Draft EIS in <b>Appendix E</b>).</p>
<p><b>Monninger Comment 8: Detailed Monitoring and Maintenance Plan</b></p> <p>In other words, TVX must submit a comprehensive M &amp; M Plan detailing the how, what, when, who, and where of the long-term monitoring and maintenance tasks. Having plans for everyday operations, assorted contingency plans, and adequate bonding is all well and good, but unless the plans can be implemented in the proper manner at the proper time, then the plans become empty-headed rhetoric.</p>	<p><b>Response:</b> Please refer to the above responses. As suggested in the comment, a monitoring and maintenance plan is included in the Applicant's Proposed Plan. Modifications have been added in the Agency Modified Plan (p. 28, Agency Modified Plan). Bonding has been imposed to conservatively fund these activities. A key requirement of the operating permit is that the applicant must perform according to the requirements of the plan. If not, enforcement action could be taken, including possible foreclosure on the bond.</p> <p>DEQ would stipulate that TVX must submit a revised detailed monitoring and maintenance plan to update the CCP to accurately reflect the changes made in the Applicant's Proposed Plan by the Agency Modified Plan in the EIS. The plan would be due to DEQ by the end of 2001 (see language added to p. 29 of the Draft EIS in <b>Appendix E</b>).</p>
<p><b>Monninger Comment 9: TSF Biological Treatment System Sludge Removal</b></p> <p><i>TSF Seepage Management, Page 9:</i></p> <p>How will precipitate from the multiple-stage process be handled and disposed of (M &amp; M)?</p>	<p><b>Response:</b> DEQ would bond for sludge removal and media replacement on an annual basis (p. 7 of detailed bond calculations for water treatment) (Detailed bond calculations are available from the DEQ Helena office). Sludge removal would be conservatively required at 10-year intervals. Sludge removal is synonymous with media (gravel) removal and replacement. The</p>



	<p>excavated gravel would be trucked offsite for disposal at an approved solid waste facility. The entrained sludge would be similar to the current treatment sludge, which is not a listed or characteristic hazardous waste regardless of Bevill Amendment Status. Several samples of process pond sludge were obtained when the process ponds over the years. None of the samples showed any metals above Toxic Contaminant Leaching Procedure (TCLP) hazardous waste characteristics. Process pond sludge is considered a worst-case surrogate for TSF biotreatment sludge. The sludge would be interstitial to the gravel and the resultant material would not constitute hazardous waste (see Table E-3 in the Draft EIS in <b>Appendix E</b> for sampling analysis of the mill process sludge).</p>
<p><b>Monninger Comment 10: Agronomic Rates and Dilution of TSF Seepage</b></p> <p>Are agronomic rates predicted just for the amount of effluent expected from the TSF, or were agronomic rate predictions inclusive of the maximum amount of Crevice Tunnel water expected for dilution purposes (TVX Contingency Plan)? How realistic are estimated agronomic rates considering the heterogeneity of the glacial till underlying this area? And exactly when has dilution been accepted as a treatment option, at least by EPA standards?</p>	<p><b>Response:</b> Agronomic rates are proposed for all TSF seepage including mixing with Crevice Adit water. The Applicant's Proposed Plan is designed as a zero discharge facility which includes the upland HDS as a contingency for higher seepage rates during wet periods. DEQ has added two other contingencies in the event the biological treatment system is down for repair or maintenance (p. 43, Agency Modified Plan). Mixing with Crevice Adit water is only proposed as a contingency in case other systems are down for repairs or maintenance or in wet years. These contingencies are not intended for continuous long-term operation, but provide additional layers of security to assure no environmental degradation can occur.</p> <p>Based on the bench scale treatment efficiency evidence, conservative evapotranspiration estimates, the large</p>

surface area of the 0.5 acre wet meadow and 1.7 acre upland HDS systems, duplicate emitter systems in the upland HDS, and two added contingencies in the Agency Modified Plan, DEQ has determined the TSF biological treatment system would successfully treat TSF seepage without depending on long-term dilution for compliance.

The upland HDS area, as included in the Applicant's Proposed Plan, has been conservatively sized at 1.7 acres, based on calculations of plant biomass and evapotranspiration (p. 20, Applicant's Proposed Plan). The upland HDS system was not proposed as a land application system. That is, the soil was not intended to "treat" the water. The revegetated plant community would consume the water, which would have been diluted below groundwater standards, and therefore, no discharge would occur. Use of Crevice Adit water for dilution is not a treatment issue as described below. Glacial/fluvial sediment heterogeneity is not an important factor in the design. The important factors are soil water holding capacity and depth of rooting of the upland HDS plant community. A conservative biomass was assumed (p. 35, Applicant's Proposed Plan).

The deep emitters in the upland HDS system would only be used as a contingency in the winter if the wet meadow HDS overflows in wet years. This use of the deep emitters in the winter would be the only potential time that water could escape the root system of plants.

The EPA only prohibits dilution to meet technology-based limits. Waste streams may be mixed. The original MPDES Permit allowed the dilution of the 1300 Level Adit water with Crevice Adit water prior to discharge to surface water. The permit

	renewal continues to allow this policy in one of the contingency plans and in all contingency discharges to ground water.
<p><b>Monninger Comment 11: Metal Attenuation Capacity of Soils</b></p> <p>Assuming agronomic rate predictions are reliable, what about long-term metals attenuation rates? At what point, if ever, will the soil not attenuate or adsorb metals? What is the Fate &amp; Transport of nitrogen in this system, particularly regarding cyanate and thiocyanate?</p>	<p><b>Response:</b> The majority of metals are attenuated in the biological treatment system media. Nitrogen species are treated to below standards in the biological treatment system. Bench scale testing confirms that nitrogen reduction is complete prior to sulfate reduction, and cyanide species are within standards (p. 20, Applicant's Proposed Plan, Seepage Quality and Figure 3-4). Nitrate plus nitrite concentrations were all less than 1 part per million (ppm). Excluding the 96-day sample of 0.75 ppm, all samples up to the 188-day termination of the test were less than 0.04 ppm. Total cyanide concentrations were uniformly low at less than 0.11 ppm (see Table E-4 in <b>Appendix E</b>).</p> <p>DEQ would stipulate in the Record of Decision that TVX sample thiocyanate in the TSF seepage before and after it leaves the biological treatment system to ensure the thiocyanate does not kill the vegetation in the wet meadow HDS.</p> <p>DEQ would bond for removal of sludges and replacement of media in the biological treatment system in the bond calculations. The majority of metals, nitrogen and cyanide species end up in the biological treatment system media and not in the soils. As a result, DEQ does not believe the soils would overload with metals or nitrogen in the wet meadow HDS or the upland HDS for a very long time.</p>

**Monninger Comment 12: Wetland Monitoring and Maintenance Requirements**

One of the myths about wetlands is that they are a "walk-away" solution to water treatment. This is not the case. There is no mention of wetlands maintenance or mention of sludge/precipitate/evaporate disposal (M & M). In addition, the statement, "Effluent from the biological system would be evapotranspired by the wet meadow vegetation, which would in turn produce more biomass as a result of the supplemental water source." This statement is nonsensical and contradictory. It does not seem as if this supplemental water would be around long enough to enable more biomass to develop, nor would this supplemental water be pumped to the site often enough if the HDS treats water as well as TVX has claimed.

**Response:** DEQ is very aware of wetland type treatment systems and does not assume that wetland type treatment systems are "walk-away" reclamation. DEQ would bond for over \$20,000 a year in annual operation and maintenance costs and for \$5,000 every 5 years for replacement of various TSF treatment system parts to ensure continued function of the system. Annual costs include replacement of the organic substrate, limestone media, sludge removal, pump maintenance, miscellaneous equipment and supplies, labor, electrical, and professional services (p. 7 and 10 of DEQ detailed bond calculations for water treatment).

The wet meadow HDS function is to evapotranspire the treated water from the biological treatment system. The site would not constantly receive treated seepage from the TSF biological treatment system. EDYS model results show this quantity to be less than 1 gpm in all cases once second year biomass is achieved on the TSF cap. First year biomass on the OTS test plots was 47 percent above the first year EDYS predictions; that is, first growing season field results are nearly sufficient to achieve full system functionality. The wet meadow HDS would receive seepage only during the wet parts of the year (spring runoff and rainfall seasons). Seepage could decline to zero during the growing season when the woody plant dominated plant community matures on the TSF. During winter, TSF seepage rates and inflows to the wet meadow are forecast to decline to or be near zero. This is the case with many wetland habitats, when recharge areas may freeze in winter. DEQ has assumed conservatively that the wet meadow HDS would indeed receive a

	<p>constant supply of water, which would promote high biomass per unit area associated with this habitat type. Conservative estimates of evapotranspiration have been included in the water balance calculations (p. 20, Applicant's Proposed Plan).</p> <p>The upland HDS would receive wet meadow HDS overflow very infrequently. The CCP includes the option to supplement the revegetation at the upland HDS with straight Crevice Adit water in order to develop greater biomass (p. 12, Applicant's Proposed Plan). The same supplemental irrigation could be done in the wet meadow HDS if needed to maintain the wetland species in dry years.</p>
<p><b>Monninger Comment 13: Dilution of TSF Seepage with Crevice Adit Water</b></p> <p>What are the regulatory issues regarding the mixing of streams? Does not the inclusion of Crevice Tunnel water with TSF effluent change the standards by which the Crevice Tunnel water is regulated (nondegradation)?</p>	<p><b>Response:</b> The Applicant's Proposed Plan is designed as a zero discharge facility which includes the upland HDS as a contingency for higher seepage rates during wet periods. The upland HDS system is proposed as a zero discharge facility. No discharge point is required, as no discharge would be made to groundwater. DEQ has added two other contingencies in the event of major maintenance or temporary problems (p. 43, Agency Modified Plan). Mixing with Crevice Adit water is only proposed as a contingency in case other systems are down for repairs or maintenance or in wet years. These contingencies are not intended for continuous long-term operation, but provide additional layers of security to assure no environmental degradation can occur. Based on the bench scale treatment efficiency evidence, conservative evapotranspiration estimates, the large surface area of the 0.5 acre wet meadow and the 1.7 acre upland HDS systems, duplicate</p>

	<p>emitter systems in the upland HDS, and two added contingencies in the Agency Modified Plan, DEQ has determined the TSF biological treatment system should successfully treat TSF seepage without depending on long-term dilution for compliance.</p> <p>See also the response to Monninger Comment No. 10 and McPhie Comment No. 5 above.</p>
<p><b>Monninger Comment 14: Crevice Adit Water Must Meet Nondegradation</b></p> <p>It was my understanding Crevice Tunnel water was exempt from nondegradation review because the Tunnel was permitted under an Exploration License. It was also my understanding that once Upper Crevice came under the Operating Permit, or the mine went into closure, the nondegradation exemption would no longer apply.</p>	<p><b>Response:</b> The Crevice Adit was permitted under an exploration license. That license included an approved reclamation plan (p. 8, Crevice Adit Discharge). The current EIS is considering changes to that plan as part of the Consolidated Closure Plan, but the authorization for the disturbance continues to be the exploration license, and the status of the discharge has never changed. The Crevice Adit discharge would be reduced by 50 percent through plugging of decant holes and the water is of exceptionally high quality. No treatment is necessary to meet all applicable water quality criteria (see Table E-5 in <b>Appendix E</b>). This discharge is not subject to nondegradation review.</p> <p>See also response to McPhie Comment 1 above.</p>
<p><b>Monninger Comment 15: 1300 Adit Precipitate and Drain Field Capacity</b></p> <p>How will precipitate be disposed of (M &amp; M)? Assuming that the septic system will remain operational for at least some period of time, is mixing septage with metals laden precipitate allowed under law? Will the two materials be co-mingled? This needs further explanation.</p>	<p><b>Response:</b> Only arsenic exceeds groundwater criteria in the 1300 Adit discharge and this would be treated to background conditions prior to discharge (CCP, Appendix C, p. C-FS-9). It is not against laws or regulations to dispose of</p>

Will not the addition of a steady state flow of 15 gpm, not to mention flow rates during spring and early summer, overwhelm the existing drainfields? Leachate from the upper drainfield has been known to surface, as a spring, just above the Old Tailings North. Is that situation allowable under the law?

industrial wastes, including metals, in a drainfield. Once treated by ferric sulfate (iron) addition, the resulting sludge volume would be small as determined by bench and pilot scale testing. DEQ does not anticipate a change in the schedule for septic tank sludge pumping over what it would be without 1300 Adit water addition. The system is currently pumped once per year. The sludge from the iron coprecipitation process and sewage would be co-mingled. The 1300 Adit treatment sludge would be an iron-arsenic oxyhydroxide. The cumulative septic/treatment sludge would be pumped by standard septic tanker truck and managed the same as other area septic tank sludge (p. 25, Agency Modified Plan).

The mill process sludge passes the TCLP test. The mill process sludge is considered a worst-case comparison for the 1300 Adit iron coprecipitation sludge (see Table E-3 in **Appendix E**).

The existing drainfields were designed for 200 people. The current use is much less. DEQ believes that the existing drainfields could handle the increase in flow by 15 gpm without any problem. DEQ would add the spring above the OTN as a monitoring point to ensure the drainfield capacity is not exceeded (see language added to p. 25 of the Draft EIS in **Appendix E**).

**RICHARD PRODGERS LETTER (BIGHORN ENVIRONMENTAL SCIENCES, LLC)**

Received March 17, 2001

**Prodgers Letter, Comment 1: Clarification of Scope of Appendix B**

Thanks for this opportunity to comment on the DEIS for the mine closure plan at the TVX Mineral Hill Mine. Amerikanuak, Inc. and I have discussed the revegetation plan for mine

**Response:** Thank you for your letter. DEQ was very clear in its use of **Appendix B**, but the public may not have realized the exact



closure. I believe that it will be more complicated and more effective than my previous comments indicated because they applied to one of three types of upland revegetation types contemplated for Mineral Hill.

My comments on revegetation as they appear in the DEIS related to the 450 Adit area. This old mine adit is surrounded by Douglas fir forest. The disturbance area is about 2.6 acres on a west-facing slope of 35 percent, a little steeper toward the bottom. The coversoil material was cast downhill during the original adit construction and recently pushed back uphill. This substrate is suitable for trees, and there is ample evidence that trees will volunteer in years of good seed crop and suitable weather.

This is one of three types of revegetation appropriate for upland sites. Where tailings underlie coversoils, the objective of erosion control remains, but maximum evapotranspiration is also important. In the long run, forest probably has the highest transpiration (+ interception) of any vegetation type, but it will take a few decades to realize this potential. In the short term, grass-forb revegetation will largely determine evapotranspiration. Fertility, including nutrient cycling, drives primary productivity, which correlates with evapotranspiration. Since nitrogen is used in greatest quantity and usually limits productivity, nitrogen fixation will be a component of revegetation. Although I have not yet drafted [a] revegetation plan, I suspect that the grass-forb component of tailings revegetation will establish a highly productive, competitive plant community that withdraws a lot of water from the four-foot-thick coversoil.

thoughts of the agency. Your letter clarifies for the public the variety of revegetation needed on the site.

DEQ has included a requirement for the applicant to retain a qualified revegetation specialist approved by the agency to prepare the detailed portion of a revegetation plan and monitoring plan, and recommend specific modifications to the revegetation plan to promote establishment of a Douglas fir forest on the TSF (p. 28, Agency Modified Plan). The details of the revegetation plan and monitoring plan review would be stipulated as part of the Final EIS in the Record of Decision.

Isn't tree establishment often deterred by competition with established, competitive herbs? Just so, although the herbs will be only one season old when Douglas fir [plants] are transplanted. Once the herbs are established, their roots and aboveground litter will hold the soil even if the plants are dead – a good thing, since we may kill some of them. At the site of each seedling transplant, a woven polypropylene mat will be placed on the ground with the seedling in the middle. (This suggestion has not yet been ruled on by Amerikanuak, Inc., so it is tentative.) The mat is stapled at the corners and near the seedling. The fabric allows passage of water, perhaps more so if a needle-punctured mat is used. Herbs under the mat die due to lack of sunlight, and the conifer seedlings get a lot of resource to grow on. This is the anti-competition element of the tailings revegetation strategy. Summing up, the idea is to prevent erosion and promote evapotranspiration in the early years with productive herbs, and later with trees. As the trees mature, the weed problem will meliorate.

The other type of upland revegetation is of the grass-forb or grass-forb-shrub type. Objectives have not been fully determined, but short-term erosion control and deterrence of weeds are sure to be among them. I mention this only to alert you that a third type of revegetation is contemplated.

I realize that in requiring that a specialist prepare a revegetation plan under the Agency Modified Plan, you realize that my report in **Appendix B** was not the whole revegetation plan. My hope is that you now have an indication of where this is headed.

**DAVID CHAMBERS (CSP<sup>2</sup>) E-MAIL**

**Received March 14, 2001**

**Chambers E-mail, Comment 1: Labor Cost Per Well**

Under Capital Costs, Task 3, line 78 - labor/equipment costs are listed as \$100/well. This only allows a couple of hours of work to complete the task. Did you mean \$1000/well?

**Response:** Montana Board of Water Well Contractors Administrative Rules (Title 36, Chapter 21) specifically require any well permanently abandoned (ARM 36.21.670) to be completely filled in such a manner that vertical movement of water within the well bore, including vertical movement of water within the annular space surrounding the well casing is effectively and permanently prohibited. All fluids within a well are to be permanently confined to the specific strata in which they were originally encountered.

DEQ assumes in the water treatment bond that each well would get plugged with 2 cubic yards of concrete grout (e.g., 100 feet average depth by 10 inches in diameter) delivered at \$150 per cubic yard (p. 2 of 12 in detailed water treatment bond calculations). The casing would then be cut off below ground surface. The hole would then be covered with soil and seeded. One laborer with a pickup earning \$32 per hour realistically should complete the work within 3 hours, thus, the \$100 per well labor cost.

**Chambers E-mail, Comment 2: Carbon Source Cost**

2. Under O&M, Task 5, Biological Treatment System: Is the cost for the carbon source included or insignificant? I didn't see it noted.

**Response:** Carbon costs included in the bond calculation for organic substrate are as follows. Methanol FOB to the mine site is \$2.55/gallon, delivered in 55-gallon drums. At 1 gpm of seepage, the treatment system would consume 183 gallons of carbon source per year, for a total cost of \$470 per year.

**Chambers E-mail, Comment 3: Indirect Costs for Replacement and Demolition Costs**

3. Replacement & Demolition Costs - Why didn't you apply Indirect Costs to these items?

**Response:** Replacement costs are considered a contingency line item over and above regular operation and maintenance costs. Adding indirect costs would be like adding a contingency on another contingency cost. Demolition costs for water treatment systems are also a contingency resulting from a March 30, 1992 Montana District Court Decision about the Golden Sunlight Mine. No indirect costs were applied to this contingency for the same reason.

**Chambers E-mail, Comment 4: Request for Unprotected NPV Spreadsheet**

I would like to look at the sensitivity of the NPV to the assumed inflation and discount rates. When I talked to Pat Plantenberg, he indicated that it might be possible to get a version of the spreadsheet that wasn't locked/protected, so I could test this. Is it possible to get a version of the file that isn't locked, or to get the password to unlock the spreadsheet?

**Response:** DEQ engineers have been instructed not to give out unprotected bond files for security reasons. The engineers would be willing to run any inflation and discount rate scenarios requested and e-mail you the results.

**DAVID CHAMBERS (CSP<sup>2</sup>) LETTER**

**Received March 19, 2001**

**Chambers, Letter, Comment 1: Wet Meadow HDS Volume**

**Chapter 3 – Seepage Quality (p.20)**

The EDYS modeling predicts evapotranspiration to be 469,000 gallons per year, equivalent to 0.9 gpm annually, in the Seepage Collection Pond (SCP) [p. 20]. The SCP will be converted to a Habitat Development Site (HDS) by filling in the

**Response:** Stormwater would be diverted away from the wet meadow HDS, as it currently is from the SCP. Therefore, only incident precipitation would enter the wet meadow HDS (p. 20, Applicant's Proposed Plan). Incident precipitation on 0.5 acres at

<p>present SCP to create a half-acre wetland.</p> <p>Since it is possible for this wetland to overflow in wet years, it is important to know what volume of water the converted SCP/wetland will hold.</p> <p><i>Please discuss the volume of the SCP/wetland in this section. The capacity of the HDS should be sufficiently large to accommodate all but the largest stormwater events.</i></p>	<p>15 inches per year would equal 140,000 gallons. The water budget for the HDS system has been designed to account for this input. DEQ believes the volume of water the wet meadow HDS could hold before it overflows would be 384,000 gallons.</p> <p>The total flow per year at 1 gpm would be 525,600 gallons of seepage reporting to the wet meadow HDS. Evapotranspiration would use up to 469,000 gallons of the seepage. The 0.5 acre SCP would be triple lined and is 8 feet deep. It is designed with an overflow pipe that would report to a pump. The pump would take the excess water if any to the upland HDS.</p> <p>DEQ does not believe that the storage capacity of the SCP would be an issue.</p>
<p><b>Chambers, Letter, Comment 2: Sensitivity of Critical Assumptions in Bond</b></p> <p><b>2. Chapter 3 – Issue 11 - Bond (p. 39)</b></p> <p>Calculation of a bond is a very complicated procedure. Because it involves not only mathematical modeling, but also a number of critical assumptions (including the rate of inflation and the discount rate), it is appropriate to perform some sensitivity analysis to test the possible consequences of the assumptions. This is information that can be discussed quite easily, and non-technically, in the EIS.</p> <p><i>The sensitivity of critical assumptions made for the bond calculation, including the inflation and discount rates, should be discussed in the EIS.</i></p>	<p><b>Response:</b> DEQ utilizes a conservative real discount factor in the calculation of the net present value (NPV) of future payments over a 100-year period (p. 44, Applicant's Proposed Plan and p. 10 of the Water Treatment Bond detailed calculations). The NPV calculation uses a real discount factor (interest minus inflation) of 3 percent. This is very conservative because the State of Montana bond funds have consistently achieved a real growth rate of 3 to 4 percent, and the state pension fund has received a 6 real growth rate. Therefore, use of a 3 percent real growth rate offers the state a significant upside potential in term of revenue generated from unplanned interest. It is not possible to justify a lower real discount rate, and therefore the state could not responsibly use a more conservative number (see language added to p. 40 of the Draft EIS in <b>Appendix E</b>) (see the final draft bond calculations summary in Table E-1 in</p>

	Appendix E).
<p><b>Chambers Letter, Comment 3: Net present Value Should be Carried for More than 100 Years</b></p> <p>At the 100-year mark, the net present value (NPV) of the bond for the Capital and the Operating &amp; Maintenance Costs is still approximately \$28,000 [see tvx_2001_agency-2.xls, 'Water Treatment', line 466]. Since there is no technical rationale presented for choosing 100 years as the cutoff time for treatment and monitoring, carrying the bond calculation beyond 100 years would still add significantly to the NPV (i.e. the net liability to DEQ and Montana taxpayers) of the bond. It would [be] fiscally prudent to carry the bond NPV out to a time when the NPV for each additional year is irrelevant.</p> <p><i>It is recommended that the bond be calculated until the net present value of the Capital and the Operating &amp; Maintenance Costs are less than \$1000 in the final year of the calculated bond, instead of terminating the calculation at 100 years.</i></p>	<p><b>Response:</b> The operation, maintenance, capital and replacement costs were estimated based on a 100-year economic model. Ninety-nine percent of the discounted costs occur within the first 100 years. Since the estimate is based on an assumed and static inflation and discount rate over 100 years, DEQ believes that running the analysis until the discounted cost reaches zero or a value less than \$1000 would not be altogether meaningful given the other variables that might have more impact.</p>
<p><b>Chambers Letter, Comment 4: Explanation of Labor and Truck Rates used in Bond</b></p> <p>A significant part of the reclamation work for several of the reclamation sub-areas, including 'Facilities', and 'Waste Dumps', assumes labor costs taken from a column titled "TVX-Mineral Hill Equipment Cost Summary". The rate listed for a (1) laborer is \$26/hr; (2) a laborer with truck is \$32/hr; and, (3) a superintendent with truck is \$60/hr. There is no explanation of how these rate estimates were calculated. [see tvx_2001_agency-2.xls, 'Labor &amp; Equipment', lines 97-99]</p> <p><i>Is DEQ confident that, if required, it could hire personnel and completely cover its costs if it</i></p>	<p><b>Response:</b> The equipment rates used in the bond calculation are from the Primedia Cost Reference Guide for Construction Equipment. Profit is set at 10 percent. Wages are derived from the prevailing wage plus fringe benefits obtained from the Montana Prevailing Wage for Heavy and Highway Construction, Montana, Department of Labor and Industry, Effective September, 1999. An overhead and profit of 58.5 percent has been applied to the wage rate from RS Means Heavy Construction Cost Data for 1999. Overhead and profit includes worker's compensation of 20 percent, an</p>

<p>were forced to manage the reclamation itself if TVX were not able to continue its management (or Amerikanuak's involvement) of the project?</p>	<p>average fixed overhead of 16.5 percent, overhead of 12 percent, and a profit of 10 percent.</p>
<p><b>Chambers Letter, Comment 5: Explanation of Site Management Bond Estimates</b></p> <p>If DEQ has to assume direct responsibility for reclamation of the site, the cost of site management during reclamation has been estimated as \$250,000/yr for 2 years. The bond estimate states "A third party engineer is expected to cost \$250,000 per year. The \$250,000 includes labor, power, insurance, taxes, leases, vehicles, computers, and etc." [see tvx_2001_agency-2.xls, 'Post Mine'].</p> <p><i>Please discuss what the assumptions, or experience, this cost estimate is based on.</i></p>	<p><b>Response:</b> This value is based on agency experience at the Zortman/Landusky Mine reduced based on the relative size of the TVX mine.</p>
<p><b>Chambers Letter, Comment 6: Labor Costs for Wells</b></p> <p>In the spreadsheet tvx_2001_agency-2.xls, 'Capital Costs', Task 3, line 78 – labor-equipment costs are listed as \$100/well. This only allows a couple of hours of work to complete the task.</p> <p><i>Were labor costs meant to be \$1000/well?</i></p>	<p><b>Response:</b> Well abandonment would consist of filling the well casing with grout. A drill rig would pump grout to fill the well casing, which is achievable at the specified rate. The estimated rig cost to accomplish this work is realistic. See also response to Chambers E-mail comment 1 above.</p>
<p><b>Chambers Letter, Comment 7: Carbon Source Cost</b></p> <p>In the spreadsheet tvx_2001_agency-2.xls, 'O&amp;M', Task 5, Biological Treatment System:</p> <p><i>Is the cost for the carbon source included or insignificant? I didn't see it noted.</i></p>	<p><b>Response:</b> Carbon costs included in the bond calculation for organic substrate are as follows. Methanol FOB mine site is \$2.55/gallon, delivered in 55 gallon drums. At 1 gpm of seepage, the treatment system would consume 183 gallons of carbon source per year, for a total cost of \$470 per year.</p>



**Chambers Letter, Comment 8: Replacement and Demolition Indirect Costs**

In the spreadsheet tvx\_2001\_agency-2.xls, 'Replacement & Demolition Costs':

*Why aren't Indirect Costs applied to these items?*

**Response:** Replacement costs are considered a contingency line item over and above regular operation and maintenance costs. Adding indirect costs would be like adding a contingency on another contingency cost. Demolition costs for water treatment systems are also a contingency resulting from a March 30, 1992 Montana District Court decision about the Golden Sunlight Mine. No indirect costs were applied to this contingency for the same reason.

**Chambers Letter, Comment 9: Stormwater Sampling of HDS Overflow**

**3. Appendix C - Draft MPDES Permit  
Stormwater overflow of the HDS – not presently included**

Since the Habitat Development Sites contain effluent that could overflow in the event of storm events, it would be appropriate to require, as a part of the stormwater plan/permit, sampling of any overflow that enters Bear Creek.

*Require sampling for arsenic in any overflow from either HDS if the overflow enters Bear Creek*

**Response:** Stormwater overflow from the wet meadow HDS would only result if the incident precipitation overflowed the storage capacity and the pumping system to the upland HDS failed. The water balance accounts for incident precipitation (p. 20, Applicant's Proposed Plan, Seepage Quality). The probability of exceeding the available stormwater storage capacity in the wet meadow is low, and it would require greater than the 10-year, 24-hour precipitation event.

Runoff from the upland HDS is always possible, depending on precipitation intensity and duration. However, once the site is reclaimed, it would no longer be a mine site and the vegetation cover from this irrigated site would control erosion equal to adjacent undisturbed sites. Water applied to this area would already meet groundwater standards, and further mixing with precipitation would occur prior to it becoming confluent to Bear Creek. DEQ believes that no sampling is necessary in the ephemeral draw below the

<p><b>Chambers Letter, Comment 10: Sampling Location and Frequency for the 1300 Adit Discharge</b></p> <p><b>Sampling at Outfall 005B (p.C-FS-12)</b></p> <p>It is proposed that a yearly sample of the effluent from the dosing chamber be collected and sampled for total and dissolved arsenic to insure that precipitated arsenic is not being remobilized or introduced into the discharge. Yearly sampling will not yield much in the way of meaningful data. More frequent monitoring would not only provide more meaningful data, but would also be more likely to detect seasonal effects on the treatment system.</p> <p>However, since Outfall 005B is the final point in the treatment system before discharge to groundwater, it would seem that this point, rather than Outfall 005A - after chemical treatment - would be the appropriate point at which to conduct compliance sampling. If it is impractical to sample at 005B on a monthly basis, as is being proposed for 005A, then 005B should be sampled quarterly, as with Outfall 001.</p> <p><i>Outfall 005B should be sampled on a monthly, or at least quarterly, schedule.</i></p>	<p>wet meadow HDS.</p> <p><b>Response:</b> Monthly sampling of the chemical addition building effluent would provide data on treatment efficiency (CCP p. C-FS-12, Appendix C). It is estimated that 730 gallons of ferric sulfate solution would be consumed annually. This equates to roughly 235 pounds of dry ferric sulfate.</p> <p>Annual sampling of the dosing tank overflow is intended as a QA measure only (CCP p. C-FS-9 and C-FS-12, Appendix C). DEQ would add quarterly monitoring of the dosing tank (see language added to the final MPDES permit in <b>Appendix E and Appendix G</b>).</p>
<p><b>DON BACHMAN (GREATER YELLOWSTONE COALITION) LETTER</b> Received March 13, 2001</p> <p>We are generally pleased with the document, and appreciate that DEQ acknowledged that the EIS process should lead to a more comprehensive and protective closure strategy for the Mineral Hill Mine.</p> <p>We support the Agency Modified Plan as the preferred alternative, but condition this support</p>	

on the following comments relating to the monitoring and maintenance.

**Bachman Letter, Comment 1: Uncertainty Drives the Need for Detailed Vegetation Monitoring and Continuous Climatic and Seepage Monitoring**

**Issue #1. Tailings Storage Facility (TSF) – Biological Treatment System, Cap Design**

The EDYS model verification (pg. 18) is based on empirical evidence of Douglas fir survival over a 10-year period, and an intentional single year experimental plot. Previous MHM proposals that were the basis for DEQ analysis indicated the water balance cap would function with revegetation of grass and forbs. A later iteration included grasses, shrubs and trees, but grass still predominated. We understand and appreciate that "DEQ believes dominance of a Douglas fir community ... would reduce the amount of seepage through the TSF..." and hope confidence will be demonstrated through attention to **Appendix B**, the Producers/Bighorn Environmental Sciences Report, 9/19/00.

The unfolding vegetation plan demonstrates the uncertainty of the TSF capping solution. This uncertainty speaks to the need for a comprehensive monitoring plan that would integrate vegetative growth and cover measurement, climatic and weather event measurement and continuous seepage quantity measurement. To accomplish this, TVX must install instrumentation that would log those parameters that are vital for verification of both the EDYS model and further hydrological monitoring. The original HELP model should be included in the verification plan as well as the more sophisticated modeling suggested on pg. 18. An annual monitoring report should be filed with DEQ and noticed for public review. The DEIS, at Issue

**Response:** DEQ disagrees with your first two sentences. The EDYS model verification is based on empirical evidence from onsite reclaimed areas dominated by grasses and forbs and not on Douglas fir survival. Previous MHM proposals did not consider a water balance cap at all. Only 15 inches of growth medium were proposed for the TSF.

Reclamation science has evolved immensely in the 1990's. Recent work by Producers and others in the Northern Great Plains and in the mountainous areas of Montana and northern Wyoming, on areas reclaimed up to 25 years ago, have identified major problems with reclamation techniques used at that time in establishing woody species. Reclamation scientists are now ready to make significant strides to enhance the success of revegetated plant communities on disturbed lands.

Water use efficiencies from many vegetation studies since the early 1900's, as shown in Table 3-2 in the Draft EIS, indicate that woody plant dominance would reduce seepage from the TSF. This is highlighted by the fact many areas in the west are being burned to reduce woody plant dominance and enhance watershed water production. Ironically, establishment of trees and shrubs on reclaimed areas has been one of the biggest shortcomings in reclaimed communities. Producers has made recommendations to ensure the survival of Douglas fir and other woody plants by reducing seeding rates, limiting the number of species and use of organic amendments

#5, suggests annual measurements, while we believe continuous measurements should be employed in the monitoring. Technology is readily available for this measurement program.

to enhance soil microbe communities. In other areas in the western US, woody plants are initially established without the competition of grasses and forbs or on specific rocky substrates.

Finally, mined land regulatory agencies have enough qualified evaluations of old reclaimed areas that identify various ways to enhance woody plant dominance and to reduce seepage. The unfolding vegetation plan does not demonstrate the uncertainty of the TSF capping solution. It shows the progression of reclamation science. Reclamation scientists know they can produce vegetation communities that meet or exceed native rangeland canopy cover, production and sometimes diversity indices. Their biggest shortcomings have been the establishment of the many diverse native forbs and woody plant species on reclaimed communities. Now, DEQ believes it has the information needed to develop the proper woody plant community.

DEQ agrees that monitoring is needed. The Agency Modified Plan would require the company retain a qualified revegetation specialist to review the revegetation plan and suggest modifications based on Proddgers' and others' research. The revegetation specialist would recommend for DEQ review and approval, the details of the revegetation monitoring plan (p. 37, Agency Modified Plan). At a minimum, that plan would collect plant cover, production and species diversity information to demonstrate that the EDYS model predicted cover biomass is achieved. The review would also include monitoring requirements for survival of woody plants, soil microbe community dynamics, soil fertility, noxious weed control, and invasion of other native species. These monitoring requirements would be specified in the Record of Decision.

	<p>The true litmus test of the TSF cap design and reclaimed plant community would be the measured seepage from the tailings. The biological treatment system inflow would be monitored on a quarterly basis. Hydrological monitoring including seepage rates would also be included, but DEQ is not convinced that it needs to be continuous and include more climate and weather data. Collection of meteorological information to aid in EDYS and HELP model verification would be useful research, and DEQ would encourage the applicant to conduct this research. However, the primary concern to DEQ would be that seepage from the pile be within design parameters for the biological treatment system. If for any reason, seepage does not decline to anticipated levels, the applicant would be required to make such modifications to the system as are necessary to correct the situation. DEQ has calculated bond for interim and ongoing treatment contingencies in the event seepage rates do not decline as designed. DEQ would bond for at least 5 years of monitoring immediately and based on the revegetation specialist's recommendations, the bond may be increased to a longer period for at least parts of the monitoring program.</p> <p>If the USFS takes over the property and wants one of its Experiment Stations to use the site for reclamation research, the extra level of monitoring as described would provide an excellent source of data.</p> <p>Typically, monitoring and maintenance reports are fairly extensive. DEQ could notify you when the reports are due and your local representative in either Helena or Gardiner could check out a copy and photocopy it at a local copy shop.</p>

**Bachman Letter, Comment 2, Issue # 7.**  
**(pg. 29) Future Land Use**

There is also uncertainty in the future land use of the MHM property. The Greater Yellowstone Coalition supports the intent of the proposed donation of this property to the US Forest Service. The Final EIS should include land use plans for the TVX property should the donation not be consummated. Regardless of how property ownership is settled, there should be provisions for an office and other space to be utilized in conjunction with monitoring and maintenance activities.

**Response:** The EIS analyzes three alternatives for modification of the approved reclamation plan for Operating Permit 00100, including the no-action alternative (p. 6, Existing Plan). The USFS has been involved as a cooperating agency in the EIS process in order to comment on reclamation and water treatment plans because they may receive the land; however, there is no federal action under consideration in this EIS (p. 2, Agency Roles and Responsibilities). Following successful discharge of the applicant's obligations under Operating Permit 00100, it is up to the private property owner to determine how to manage or dispose of the private property. DEQ has no standing or intent to obtain a standing relative to private property rights.

If the USFS assumes the ownership of the property, residential subdivision or commercial development would not be a possibility in the future. As long as an operating permit is in place for the mine site, TVX could propose a land use change to residential subdivision or commercial development for all or part of the property and DEQ would have to analyze the environmental impacts of that land use change. The MMRA does not preclude the potential use of a mine site for subdivisions or commercial development.

Once the reclamation bond is released on an operating permit, the landowner can do anything he wants with the private property, including subdivision or commercial development, as long as the landowner complies with other State of Montana regulations.

	<p>The laws under which the land would be donated to the USFS would preclude claim staking and mining under the 1872 mining law.</p> <p>If TVX continues to maintain the property they would have a facility to use for office space etc. If TVX were to file for bankruptcy, DEQ would have to address the issue. If the USFS receives the property, they would have to address the issue.</p>
<p><b><u>Bachman Letter, Comment 3, Issue # 9</u></b> <b>Revegetation</b></p> <p>As stated in Issue #1, the TSF cap design is dependent upon a functional revegetation program. The difficulty of high elevation reclamation is well known, and this site represents a high and relatively dry environment subject to seasonal climatic extremes. We support the DEQ requirement that Prodders revegetation recommendations be followed. <u>Monitoring and response to failure must be a clear element of the final plan.</u> Revegetation of waste rock and other disturbed areas must also be monitored. Some revegetation issues will be noxious weeds, survivability, functionality (TSF cap design), wildlife damage, mulch and amendments (if necessary) and revegetation maintenance (gardening).</p>	<p><b>Response:</b> Thank you for your list of concerns. They will be incorporated into the list of issues DEQ would like the revegetation specialist to review. The revegetation specialist would recommend to DEQ the need for long-term monitoring because of the need for dominance by Douglas fir on the TSF. DEQ also would require monitoring of other areas and not just the TSF (see response to Bachman comment 1 and the Prodders comment 1 above). The list of monitoring requirements would be specified in the Record of Decision.</p>
<p><b><u>Bachman Letter, Comment 4: Issue #11.</u></b> <b>Bonding.</b></p> <p>Dr. David Chambers will submit comments on behalf of GYC regarding the issue of bonding.</p> <p>It appears that this EIS and the Mineral Hill Mine Consolidated Closure Plan represents the best effort to comply with applicable federal and state laws and regulations. The success of the proposed plan is dependent not only on the work to be performed, but on a committed</p>	<p><b>Response:</b> See the responses to Chambers's letter and E-mail above.</p>



monitoring and maintenance program.	
<p style="text-align: center;"><b>DANA ALLEN (USEPA) LETTER</b> Received March 20, 2001</p> <p><b>Tailings Storage Facility (TSF)</b></p> <p><b>Allen Letter, Comment 1: Regulatory Mechanism to Switch to Biological Treatment System</b></p> <p>What is the regulatory mechanism by which TVX Mine will be legally obligated to continue to utilize the existing reverse osmosis (RO) wastewater treatment system to treat tailings pond effluent until flows drop below 1.0 gpm and the proposed four-stage biological treatment system has been proven effective? Is there a regulatory approval necessary for the applicant to change from the existing treatment system [?] [Or is there] such a provision [in] the mine operating permit?</p>	<p><b>Response:</b> The approval of a closure plan as modified in this EIS and stipulated in the Record of Decision would require TVX to continue to treat the TSF seepage in the RO/evaporation system until the flow drops below 1 gpm. This is also addressed in the final MPDES permit in <b>Appendix G</b>. The only regulatory approval necessary would be for TVX to contact the DEQ Environmental Management Bureau and the Water Protection Bureau and request the switch over to the biological treatment system. The approval would be based on sampling analyses that show the flow has decreased to the performance level of 1 gpm.</p>
<p><b>Allen Letter, Comment 2: Add Flow and Quality Limits from Biological Reactors to MPDES Permit and Report Use of Upland HDS and Contingencies</b></p> <p>2. It is unclear if there are any permit limits or performance specifications that apply to discharges from the biological reactors. It appears from the draft MPDES permit that the discharge limits for the RO treatment system for Outfall 002 will no longer apply after successful start-up of the biological treatment system. We recommend that the discharge quality and flow from the biological reactors continue to be limited under an MPDES permit. Through the MPDES permit, TVX should also report the use of the upland Habitat</p>	<p><b>Response:</b> The TSF biological treatment system is designed to be a zero discharging system (see response to McPhie comment 3 above). No discharge would be made and therefore no MPDES permit is required. The DEQ operating permit would monitor the TSF and its performance. If a discharge is discovered the permittee would have to get a revised MPDES permit.</p> <p>The permittee would be required to inform the department if the upland HDS or other</p>

Development Site and the other contingency alternatives.	contingency plans are to be used. The permit has been so modified (see language added to <b>Appendix E</b> and <b>Appendix G</b> ).
<p><b>Allen Letter, Comment 3: Buildup of Deleterious Substances in the Wet Meadow Substrate or Vegetation</b></p> <p>3. For final disposal of the treated tailings pond seepage in the meadow evaporation system(s), is there likely to be a buildup of any deleterious constituents in the soil or vegetation over time? Were there any study or long-term forecasts of possible accumulation of conservative substances (e.g., metals or metalloids) in either wet meadow substrate or in subsequent vegetation? Is this possibly a long-term concern?</p>	<p><b>Response:</b> Pilot studies by TVX showed all metals are attenuated in the biological treatment system media. Nitrogen species were treated to below standards in the biological treatment system as well. Bench scale testing confirms that nitrogen reduction was complete prior to sulfate reduction, and cyanide species were within standards (p. 20, Applicant's Proposed Plan, Seepage Quality and Figure 3-4). Nitrate plus nitrite concentrations were all less than 1 ppm. Excluding the 96-day sample of 0.75 ppm, all samples up to the 188-day termination of the test were less than 0.04 ppm. Total cyanide concentrations were uniformly low at less than 0.11 ppm (see Table E-4 in <b>Appendix E</b>).</p> <p>DEQ would bond for removal of sludges and replacement of media in the biological treatment system in the bond calculations. The majority of metals, nitrogen and cyanide species end up in the biological treatment system media and not in the soils. As a result, DEQ does not believe the soils would overload with metals or nitrogen in the wet meadow HDS, the upland HDS soils or vegetation for a very long time, if ever.</p>
<p><b>Allen Letter, Comment 4: Potential for Geochemical Changes in Tailings Over Time</b></p> <p>Are any geochemical changes likely in the tailings pile over time as caps are put in place and drain down continues? Will any changes</p>	<p><b>Response:</b> Currently, TSF seepage contains 3,100 mg/L sulfate and the pH is 6.1 s.u. DEQ reported TSF seepage contains an</p>

in valence or oxidation conditions lead to mobilization of constituents presently geochemically bound in place? Any such changes, if significant, could require changes in the wastewater treatment unit processes. Will there be any significant quantities of metal-sulfide precipitation sludges generated over time from this treatment system that will constitute operation and maintenance concerns?

average of 2,872 mg/L sulfate and the pH is an average of 6.9 s.u. in Table 3.1 in the Draft EIS.

Water quality in and around the historic old tailings in the TVX Mineral Hill Mine area were sampled as a surrogate to predict potential future water quality from the TSF area. Water quality in and immediately below the Old Tailings South (OTS) tailings pond was sampled and contained an average of 558 mg/L sulfate and the pH was between 7.0 and 9.0 s.u. These samples showed no pH reduction or other signs of ARD.

The groundwater was also sampled in the alluvium below the historic Old Tailings North (OTN) area after the OTN area was reclaimed in 1996. Water quality in 9 wells was sampled from April 1997 to December 1999 (see Maxim 2000. "1999 Water Monitoring Resources Report For The Old Tailings North Site. Mineral Hill Mine, Park County Montana". April 2000, in **Appendix E-1 to Appendix E** in the Draft EIS). The groundwater in the 9 wells sampled had pH values ranging from 4.58-8.08 s.u.

Lysimeter data were collected from 6 lysimeters in the OTS area in January, February and March 2000. The lysimeter data showed the pH ranged from 6.9-8.9 (see Table E-2 in **Appendix E**). The lysimeters were completed at the base of the tailings deposit and in the soils immediately underlying the tailings. Samples were also collected from the unsaturated tailings. DEQ does not believe the limited long-term seepage from the reclaimed TSF would be worse than the OTS lysimeter water quality. The OTS tailings have been unreclaimed and weathering in place for over 50 years.

	<p>DEQ believes that any water quality changes over time can be handled in the biological treatment system. DEQ would bond for professional services in case the system needs to be modified over time.</p> <p>DEQ would bond for yearly removal and replacement of media in the biological treatment system to deal with accumulation of sludges.</p>
<p><b>Allen Letter, Comment 5: Need for Monitoring Well Below the Wet Meadow HDS</b></p> <p><b>Habitat development sites (HDS)</b></p> <p>5. We recommend that a performance monitoring well be installed below the wet meadow HDS. We recognize that this is designed to be a non-discharging facility (especially with the Agency contingencies); however, there are always design and operational uncertainties. This well does not necessarily need to be a compliance outfall in the MPDES permit but installing this well and requiring that it be monitored as a performance monitoring location should be an MPDES requirement.</p>	<p><b>Response:</b> Monitoring well MW-9 is located directly downgradient of the Seepage Collection Pond (SCP). It was installed in 1991. It is currently part of the approved monitoring program under the operating permit.</p>
<p><b>Allen Letter, Comment 6: Need for table Showing Crevice Adit Water Quality</b></p> <p><b>Crevice Adit Water System Design</b></p> <p>The DEIS does not contain any water quality data for the Crevice Adit discharge. A table similar to that for the 1300 Adit discharge (Table 3-6) should be included.</p>	<p><b>Response:</b> Crevice Adit water meets all water quality standards (see Table E-5 in Appendix E.</p>
<p><b>Allen Letter, Comment 7: Capacity of Crevice Adit Water System Pipeline and Chance for Other Springs to Develop Cause</b></p>	

### of Plugging Drill Holes

7. Will the Crevice Adit water system design be adequate if the total discharge from the Crevice Adit cannot be reduced to 200 gpm? We recommend that the discharge structures/pipes be sized for the higher historic flows. Also, if the inflow to the Crevice Adit is reduced by plugging draining drill holes – what is the chance of the water discharging somewhere else and requiring an MPDES permit?

**Response:** The Crevice Adit water system would be an 8-inch, SDR-11 HDPE pipeline capable of handling a flow in excess of 1200 gpm. DEQ believes the pipeline can handle the current total flow of less than 400 gpm.

Plugging the drill holes would help to slow down the dewatering of Crevice Mountain and help to maintain the Crevice Adit flow at a steady state. DEQ does not believe the water table would rebound to pre-mining levels and therefore the chance of establishing new springs is minimal.

### Allen Letter, Comment 8: Potential for Sludge Buildup in Septic System and Disposal

#### 1300 Adit Drainage

8. How will the sludge/precipitant be disposed of from treatment of the adit discharge from the 1300 Portal? The DEIS indicated there will be a minimal amount of residual from the arsenic co-precipitation by the ferric sulfate; however, the EIS does not discuss disposal. How frequently does TVX anticipate sludge removal, yearly, every ten years? We also have concerns that the arsenic/iron precipitant could be pumped out and disposed of as domestic septage. It is also unclear from the EIS if any domestic users are still connected to the septic tanks and drainfields.

**Response:** Only arsenic exceeds a groundwater criterion in the 1300 Adit discharge (CCP, Appendix C, p. C-FS-9). Once treated by ferric sulfate (iron) addition, the resulting sludge volume would be small as determined by bench and pilot scale testing. DEQ does not anticipate a change in the schedule for septic tank sludge pumping over what it would be without 1300 Adit water addition. The sludge from the iron coprecipitation process and sewage would be co-mingled. The 1300 treatment sludge would be an iron-arsenic oxyhydroxide. The cumulative septic/treatment sludge would be pumped by standard septic tanker truck and managed the same as other septic tank sludge in the Park County area (p. 25, Agency Modified Plan). The mill process sludge passes the TCLP test (see Table E-3 in **Appendix E**).

	<p>The existing drainfields were designed for 200 people. The current use is much less. DEQ believes that the existing drainfields could handle the increase in flow by 15 gpm without any problem. The frequency of pumping would depend on the amount of use by the local residents. Currently the system is pumped once per year. DEQ would add the spring above the OTN as a monitoring point to ensure the drainfield capacity is not exceeded.</p>
<p><b>Allen Letter, Comment 9: Potential for Accumulation of Residues in Drainfield and Lifespan of Drainfields</b></p> <p>9. Is there any probability that chemical precipitation residues will accumulate in either of the proposed drainfields located downstream of the ferric sulfate treatment system for the 1300 Portal? If these drainfields might become clogged by chemical precipitation residues at some point in time, is there any mechanism proposed to clean or rehabilitate them? What is the overall life expectancy of such a system? Are replacement costs factored into the operations and maintenance calculations?</p>	<p><b>Response:</b> The precipitates (sludges) would accumulate in the septic tank and dosing tank and not report to the drainfield. The life expectancy of a drainfield is indefinite, if biofouling is controlled through septic tank pumping. Based on thousands of inspections, even improperly operated septic drainfields have been found to be operating successfully after 40 years (Personal Communication with Park County Sanitarian). DEQ would bond for \$5,000 for replacement costs every 5 years and another \$5,000 for replacement costs every 20 years for the 1300 Adit Water System (p. 10 of 12 of DEQ detailed final draft water treatment bond calculations).</p>
<p><b>Allen Letter, Comment 10: More Frequent Monitoring Needed for 1300 Adit Water Before It Leaves The Dosing Tank</b></p> <p>10. We recommend monitoring of the 1300 adit discharge more frequently than once per year (after it leaves the chemical addition building and before it leaves the dosing tank). We recommend quarterly monitoring to provide data to evaluate treatment levels and catch malfunctions within a reasonable time.</p>	<p><b>Response:</b> The 1300 Adit discharge would be monitored monthly downstream of the chemical addition building. Monthly sampling of the chemical addition building effluent would provide data on treatment efficiency (CCP p. C-FS-12, Appendix C).</p>

	<p>Annual sampling of the dosing tank overflow is intended as a QA measure only (CCP p. C-FS-9 and C-FS-12, Appendix C). DEQ would add quarterly monitoring of the dosing tank (see language added to the final MPDES permit in <b>Appendix E</b> and <b>Appendix G</b>).</p>
<p><b>Allen Letter, Comment 11: Regulatory Change in Arsenic Standard</b></p> <p><b>Arsenic Standard Change</b></p> <p>11. EPA promulgated a revised MCL for Arsenic on January 22, 2001, of 0.01 mg/L (10 ug/l). Is this regulatory change going to affect the Montana ground water standard of 0.02 mg/L? In the past, Montana groundwater standards were generally expressed as an percentage of promulgated MCL's under the Safe Drinking Water Act. The Final EIS needs to explain the significance of this regulatory change, if any.</p>	<p><b>Response:</b> Since the EPA letter was written, the regulatory change has been delayed and is in a review process. The Draft EIS does not need to be changed. See response to Allen E-mail, Comment 1 below.</p> <p>If the EPA promulgated a new standard the State would have to make rule changes to adopt the new standard. After 5 years, when the permit is renewed, the new standard would take effect with the provision for compliance schedules.</p>
<p><b>UIC Permit</b></p> <p><b>Allen Letter, Comment 12: UIC Permit Status</b></p> <p>12. The EIS should discuss the UIC site specific permit now being issued by the MT office of EPA. It is mentioned on page 5 of the EIS this may be required - but there is no discussion about the fact that a site-specific permit is being issued for the 1300 adit discharge.</p>	<p><b>Response:</b> DEQ met with the USFS, TVX and the EPA on March 27, 2001 to discuss the need for an UIC permit. TVX has subsequently submitted an application and the EPA is doing a review so that a decision can be made before the Record of Decision.</p>



**Allen Comment 13, Bond Instrument for Water Treatment and Contingency Bonds**

**Bond**

13. The DEIS mentions that the existing bonds are irrevocable letters of credit. However, the DEIS does not describe the bond vehicles for the water treatment and contingency bonds. This information should be added to the FEIS.

**Response:** The bonds are currently all irrevocable letters of credit. DEQ accepts surety bonds as well. Any bond posted must be approved by DEQ (see language added to p. 44 of the DEIS in **Appendix E**).

**Allen Letter, Comment 14: Conditions and Proof Necessary to Cash in Letters of Credit**

14. As we understand bonding arrangements, letters of credit are contracts with banks to pay under certain conditions. It would be helpful to include in the FEIS a discussion of the types of conditions and level of proof that would be necessary to receive payments from the bank on letter(s) of credit.

**Response:** DEQ may cause forfeiture of a letter of credit under two circumstances. First, payment may be sought following the DEQ's notification of an operator of a failure to complete reclamation in accordance with the MMRA, Section 82-4-341(2), MCA, or to complete reclamation in accordance with its approved reclamation plan within 2 years after completion or abandonment of its operation. Second, payment may be sought in the event the bank elects not to renew the letter of credit and the operator fails to submit replacement bond.

DEQ receives payment upon sending certification to the bank of the existence of one of these circumstances. The bank has no standing to challenge the basis for the forfeiture of the letter of credit. If payment is not received within 30 days, DEQ may commence an action in district court.

The permittee may challenge DEQ's forfeiture of the letter of credit in a contested case hearing under the Montana Administrative Procedure Act. DEQ would prevail in that forum upon establishing the

	<p>factual basis for the forfeiture by a preponderance of evidence (see language added to p. 44 of the Draft EIS in <b>Appendix E</b>).</p>
<p><b>Allen Letter, Comment 15: Describe Plan for Monitoring Well-10 Remediation</b></p> <p><b>Groundwater</b></p> <p>15. The plan to address the high nitrate in well MW-10 that has been approved should be discussed in more detail in the FEIS. The plan, as we understand it, is to wait to see if the concentration in MW-10 declines to less than 10 mg/L. For example, at what nitrate concentration or time limit will TVX need to take additional action?</p>	<p><b>Response:</b> The plan for MW-10 is discussed on p. 44-45 of the DEIS. More detail can be found in the "Monitoring Well MW-10 Nitrate Source Identification and Compliance Action Plan Progress Report, November 1999" and "Monitoring Well MW-10 Nitrate Compliance Progress Report, August 2000" available at DEQ offices in Helena.</p> <p>Remediation by natural processes may be quite slow in tight formations. No environmental degradation has been detected under current conditions in any other area near the well. As long as nitrate levels in MW-10 continue to fall, DEQ believes monitoring alone is adequate at this time to protect the environment. If at the end of 2001, the nitrate level has stabilized and it is still above 10.0 mg/L, DEQ would require the remediation process to begin (see language added to p. 46 of the Draft EIS in <b>Appendix E</b>).</p>
<p><b>Editorial Comments</b></p> <p><b>Allen Letter, Comment 16: Editorial Comment</b></p> <p>16. Page ES-2 the Crevice Adit Water System Design should be issue 3, not 2.</p>	<p><b>Response:</b> Thank you for the comment. The change has been made in the Final EIS.</p>

**GEORGE NELL LETTER**  
**Received March 19, 2001**

Thank you for the opportunity to respond to the TVX Consolidated Closure Plan Draft EIS. This mine has been a good example of how mining can be done with concern for the environment and the local community. I hope that the final closure and future management of the site is done in the same manner.

My first concern is that initially there was not going to be an EIS done on this mine closure. With the changes that have come about since the first closure plan it is obvious that the scoping process and EIS was very much needed and that MEPA is a viable and workable tool.

**Nell Letter, Comment 1: Biological Treatment System and Cap Design Has Not Been Tested**

Another concern of mine is the fact that the Biological Treatment System and Cap Design for the tailings pile has not been tested anywhere.

**Response:** The Consolidated Closure Plan in sub-appendices to Appendix 8 cite a limited number of other locations where the biological treatment system chemistry proposed at TVX for the TSF has been tested (1) Shepherd Miller, Inc. 2000. "Treatment and Disposal of Mineral Hill Mine Tailings Storage Facility Effluent". Technical Memorandum SMI3100639. October 4, 2000. 2 pages plus attached 11-page report with Tables and Figures; and 2) Knight Piesold 1999. "TVX Mineral Hill Mine Site Treatment of Tailings Storage Facility Underliner Effluent Conceptual Passive Treatment System Design and Basis". 11-page letter and attached Tables and Figures (see language added to p. 9 of the Draft EIS in **Appendix E**). As a result, DEQ believes the system would work at TVX.

DEQ would bond for operation, maintenance and replacement costs for the biological treatment system to ensure it works over time.

The cap design is standard reclamation science using a thick growth medium layer that approaches a water balance type design to remove as much soil moisture as possible to limit seepage into the tailings (p. 9, Applicant's Proposed Plan, TSF Cap Design). DEQ has assumed that at least some seepage would always report out of the TSF and need to be treated (p 17-19, Applicant's Proposed Plan, Cap Design). Additional contingencies for water treatment have also been added to the plan (see Figure 1 in **Appendix D**).

Reclamation science has evolved immensely in the 1990's. Recent work by Prodgers and others in the Northern Great Plains and in the mountainous areas of Montana and northern Wyoming on areas reclaimed up to 25 years ago have identified major problems with reclamation techniques used at that time in establishing woody species. Reclamation scientists are now making significant strides to enhance the success of revegetated plant communities on disturbed lands.

Water use efficiencies from many vegetation studies since the early 1900's, as shown in Table 3-2 in the Draft EIS, indicate that woody plant dominance would reduce seepage from the TSF. This is highlighted by the fact many areas in the west are being burned to reduce woody plant dominance and enhance watershed water production. Ironically, establishment of trees and shrubs on reclaimed areas has been one of the biggest shortcomings in reclaimed communities. Prodgers has made recommendations to ensure the survival of Douglas fir and other woody plants by reducing seeding rates, limiting the number

of species and use of organic amendments to enhance soil microbe communities. In other areas in the western US, woody plants are initially established without the competition of grasses and forbs or on specific rocky substrates.

Finally, mined land regulatory agencies have enough qualified evaluations of old reclaimed areas that identify various ways to enhance woody plant dominance and to reduce seepage. The unfolding vegetation plan does not demonstrate the uncertainty of the TSF capping solution. It shows the progression of reclamation science. Reclamation scientists know they can produce vegetation communities that meet or exceed native rangeland canopy cover, production and sometimes diversity indices. Their biggest shortcomings have been the establishment of the many diverse native forbs and woody plant species on reclaimed communities. Now, DEQ believes it has the information needed to develop the woody plant community needed.

The Agency Modified Plan would require the company retain a qualified revegetation specialist to review the revegetation plan and suggest modifications based on Proddgers' and others' research and then recommend for DEQ review and approval the details of the revegetation monitoring plan (p. 37, Agency Modified Plan). At a minimum, that plan would collect plant cover, production and species diversity information to demonstrate that the EDYS model predicted cover biomass is achieved. The review would also include monitoring requirements for survival of woody plants, soil microbe community dynamics, soil fertility, noxious weed control, and invasion of other native species. These monitoring requirements would be specified in the Record of Decision.

**Nell Letter, Comment 2: Tree Roots In Tailings**

To allow tree roots to invade the tailings directly in hopes that the root system will absorb all the water that infiltrates the tailings pile goes against standard reclamation practices. I hope that if this design does not work that an alternative plan has been thought of to manage this problem.

**Response:** The tailings are not conducive to tree root growth. The potential impacts of tree roots on the proposed cap design are discussed in the Draft EIS (p. 34, Applicant's Proposed Plan). DEQ has assumed that the majority of water use would occur in the top 48-inch growth layer and not in the tailings. Any water that makes it to the tailings has been assumed to report out the bottom and would need to be treated. DEQ would bond for treatment of seepage and has developed contingency plans for water treatment from the TSF (see Figure 1 in **Appendix D**). DEQ is convinced that the Applicant's Proposed Plan is better than the Existing Plan and would work on the site as modified by the agency.

Metals uptake by plants growing on first year test plots show that no plant toxicity would occur, and only minor short-term grazer toxicity could result, if grazers consumed large quantities of lambsquarters. No long-term toxicity would occur (p. 35, Applicant's Proposed Plan). The reclamation cap is four times thicker than the test plot cap, and impacts forecast from these data are very conservative.

**Nell Letter, Comment 3: Bitterroot Plants on Site**

The mine site contains Bitterroot plants, which are a protected plant in the state of Montana. It would be good if these plants can be protected during the restoration process. I know that a small group of them have been identified and marked to protect them from being disturbed. I hope to get permission from the mining company to go to the site in June, while the Bitterroot are in bloom, and mark

**Response:** DEQ would encourage you to contact Frank Bergstrom at the TVX Mine site to coordinate the trip. DEQ would agree to not reclaiming the area, if that area is not critical to the implementation of the selected closure plan and the population can be avoided. DEQ and TVX believe the area you are talking about is native and would not be disturbed as part of the reclamation activities.

them so they can be left to grow undisturbed.

**Nell Letter, Comment 4: Length of Life of Liner**

Finally, I am not sure how long the liner used to contain the tailings is supposed to last or what the long-term picture is for these former mine sites. I can only presume that there will still be high levels of arsenic and heavy metals to be dealt with.

**Response:** The liner system under the tailings storage facility is actually a composite liner system with 60 mil PVC overlying 9 inches of bentonite amended soil. Both liners were installed under a rigorous quality control plan to ensure the liner construction was performed correctly and documented fully. Since the liners are buried and properly installed, an extremely long service lifetime can be expected.

Personnel from the PVC Geomembrane Institute at the University of Illinois have tested PVC liner that was installed over 30 years ago and the PVC passed all current test standards. PVC applications such as use as repository liners have a history of use of only 30-40 years. So, it is safe to assume that the liner at TVX has a minimum life span of 30 years and probably more (plus 100 years). Exposure to volatile organic compounds is the primary vehicle for PVC breakdown. There are no volatile organic compounds at the TVX repository.

**JULIA PAGE (PRESIDENT, BEAR CREEK COUNCIL) LETTER**

**Received March 20, 2001**

First of all, we are pleased the Department actually wrote this document and reviewed the closure plan for the mine in one comprehensive document. Through this process we have seen the proposal for handling the various mine discharges change and improve significantly.

We support the Department's Agency Modified Plan, but we would like to see some changes



<p>and amendments to what has been presented in the document. Our comments follow.</p>	
<p><b>Page Letter, Comment 1: Monitoring Plan Must Provide for Revising Revegetation Plan</b></p> <p>Building on the concerns expressed by Bill Edwards and Richard Parks at the public hearing, we concur with the Agency recommendation that the applicant incorporate the suggestions contained in the Prodgers report and hire a revegetation specialist, experienced in mined land reclamation, to design, oversee and then monitor the progress of the revegetation efforts at the TSF as well as throughout the mine property. Bonding for the revegetation efforts should be increased to at least \$2,500 per acre, and we concur that a monitoring plan needs to be devised by which to judge the success of the revegetation efforts. The plan must include the flexibility to revise revegetation methods if preliminary monitoring shows poor results.</p>	<p><b>Response:</b> DEQ would include in its stipulation attached to the requirement for a revegetation monitoring plan, that the plan must provide for revising the revegetation plan if poor results are documented. The conditions of the revegetation and monitoring plan review would be stipulated in the Record of Decision.</p>
<p><b>Page Letter, Comment 2: Commitment to Land Use Restrictions from TVX</b></p> <p>Bear Creek Council strongly supports the idea of transferring the mine property to the Forest Service. At the public meeting, it came out that negotiations were under way with our congressional delegation for special legislation to make such a transfer possible. We support that effort, but would like to see a commitment in the CCP to a contingency that would include wildlife habitat, public access and recreation as preferred future uses of the land in case transfer to the Forest Service does not happen.</p>	<p><b>Response:</b> The CCP, in accordance with the approved reclamation plan, states the post-mining land uses would include recreation, wildlife habitat, water quality protection, hunting, logging, and tourism. DEQ administers the MMRA and its associated rules and regulations. The operating permit holder proposes a post-mine land use and the DEQ analyzes the proposed reclamation plan to ensure it would provide for that use. DEQ does not believe it can require a specific post-mine land use. This would restrict the potential use of private property and could be considered a takings. This land use restriction would have to be a voluntary commitment by TVX.</p>

	<p>In addition, MEPA requires DEQ to evaluate any proposed regulatory restrictions on the use of private property. This evaluation of regulatory restrictions must include a discussion of whether alternatives have been analyzed that reduce, minimize or eliminate the regulation of private property rights. DEQ has not imposed any requirements that would restrict the use of private property.</p> <p>The USFS is a cooperator on preparation of this EIS. Your comments have been forwarded to USFS reviewers. It is premature to state under what authorities the USFS might acquire the properties. The acquisition authority would determine the manner and extent to which NEPA would apply.</p>
<p><b>Page Letter, Comment 3: Skertich Water Supply</b></p> <p>The CCP speaks of creating a potable water and fire water supply available to the historic district of Jardine from the Crevice Adit water. The Skertiches, who live in the historic district adjacent to the mine property on the east side of Bear Creek have expressed interest in tapping into that water supply. Their ability to do so, running the pipe to the water supply tank at their own expense, has been assumed. We would like to have the availability of that water affirmed in the final plan. This water would be a superior source of clean drinking water for their household. In addition, their use of the water would help keep water moving through the system, which would decrease the amount of discharge to Bear Creek and help with freezing problems in the winter months.</p>	<p><b>Response:</b> TVX offered the Crevice Adit water as a source for a public water supply and fire suppression system for the residents of the Jardine Historic District. TVX has proposed to construct a new groundwater source, potable water supply for the Jardine Historic District (p. 10, Applicant's Proposed Plan). The system design would have to be approved by DEQ. To make use of that source, the residents would have to organize into a Public Water Supply System (PWSS) entity that could operate and maintain the system in accordance with State of Montana requirements. TVX has never offered to operate and maintain the PWSS for the benefit of Jardine residents (Frank Bergstrom, April 6, 2001. Personal Communication with Patrick Plantenberg, Helena, MT) (see language added to p. 23 of the Draft EIS in <b>Appendix E</b>).</p>

**Page Letter, Comment 4, Bond Release Schedule**

The Department needs to include a schedule for bond release that would clearly show the anticipated closure thresholds to be met and bond amount to be released.

**Response:** The schedule for bond release is dependent on successful completion of the bonded obligations. Reclamation is to be completed within two years of the Record of Decision, which is expected in May 2001. TVX has indicated their schedule is to complete the reclamation within one year. The reclamation and water treatment bond could be reassessed annually, but at least every 5 years. As operational experience is gathered, adjustments in the water treatment bond would be appropriate.

If TVX continues to hold the property for an extended period of time, they can propose bond release increments at any time. DEQ would review the proposal, inspect the site and publish the bond release request.

DEQ initiated a bond review as part of a TVX request for a permit revision in November 1999.

TVX requested a partial bond release on December 12, 2000 for work successfully completed. The draft bond calculated for the Agency Modified Plan in the Draft EIS did credit TVX for work completed in 2000. The final draft bond calculations in Table E-1 in **Appendix E** also credits TVX for work completed. Portions of major reclamation items are complete and the proposed bond release includes credit for the following items:

Item #1 Facilities

- Collection and disposal of hazardous waste
- Removal of some abandoned equipment

& materials

- Process Pond Reclamation (except proof of revegetation)

#### Item #2 Tailings Storage Facility

- Construct toe dam
- Construct base double liner
- Recontour surface to approved post-mining contour
- Compact tailings and placement of 18 inches of subsoil

#### Item #3 Old Tailings South

- Remove and Reclaim Old Tailings South area (except proof of revegetation)

#### Item #4 Roads

- 8400 feet of road were reclaimed (except proof of revegetation)

#### Item #5 Underground Openings

- Closure of 450 and 750 level underground openings
- Complete underground backfill
- Complete backfill of Top of Mineral Hill Vent and Fill raises

#### Item #6 Development Rock Piles

- Recontour, soil placement and seed, Top of Mineral Hill, 450 Level dump, 750 level dump

(Note: A mistake was made in the final draft bond. Credit was not given for First Chance portal reclamation. This will be corrected in the final bond calculation in the Record of Decision).

The only acres that would receive a full bond release are the acres that were proposed to be disturbed and that were not disturbed because the mine shut down sooner than projected.

DEQ has scheduled a bond release hearing on April 26, 2001 in Gardiner. Based on comments received on the proposed bond release, the bond amount would be adjusted and the final bond calculation would be included in the Record of Decision.

The draft bond calculation for the Agency Modified Plan in the Draft EIS totaled \$3,395,000 for reclamation and \$6,419,000 for water treatment after the credits were deducted (see Table 3-7 in the Draft EIS). The final draft bond calculation for the Agency Modified Plan in the Final EIS totals \$3,280,000 for reclamation and \$5,189,000 for water treatment after the credit for work completed is deducted (see Table E-1 in **Appendix E**). The difference from the draft bond in the Draft EIS is because of supplementary information supplied by TVX and the public comments received on the Draft EIS.

The final draft bond totals \$8,479,000. The current bond held by DEQ totals \$7,606,826. No bond money would be released as a result of this proposed bond release. TVX would simply have to post less additional bond.

The MMRA does not require bonds for government agencies (ARM 17.24.101). The USFS is very aware of the liabilities and costs associated with accepting the property from TVX. The land transfer agreement would identify the level of work needed to be done on the property before the USFS would accept it.

	<p>Normally, before a bond can be released, any affected party can request a contested case hearing under the Montana Administrative Procedure Act. If the land transfer to the USFS is approved, then DEQ would administratively have no choice but to release the bond back to TVX (see language added to p. 43 of the Draft EIS in <b>Appendix E</b>).</p> <p>If the property were transferred to the USFS, the USFS would insure that the operating permit and MPDES permit conditions would be met.</p>
<p><b>Page Letter, Comment 5: Copy of Maintenance and Monitoring Reports</b></p> <p>Our comments also incorporate the comments made at the public meeting in Gardiner by Richard Parks, Bill Edwards, Miriam Skertich, George Nell and myself. We look forward to seeing the final document, and we would like to receive maintenance and monitoring reports as they are available.</p>	<p><b>Response:</b> Typically monitoring and maintenance reports are fairly extensive. DEQ could notify you when they are due and your local representative in either Helena or Gardiner could check out a copy and photocopy it at the local copy shop.</p>
<p><b>Page Letter, Comment 6: Bear Creek Macroinvertebrate Study</b></p> <p>One additional thought: between 1989 and 1993, Bear Creek Council conducted an aquatic macroinvertebrate study utilizing sites on Bear Creek above and below the mine and on the Yellowstone River above and below the mouth of Bear Creek. The reports from that work were sent to the Department of Health and Environmental Sciences in 1995 (we have copies also) and serve as a baseline view of the health for those streams at that time.</p>	<p><b>Response:</b> Thank you for your comment. DEQ will check to ensure the copies are in the DEQ library.</p>

**FRANK BERGSTROM, TVX MINERAL HILL  
MINE, LETTER**

**Received March 20, 2001**

**Bergstrom Letter, Comment 1: Professional  
Services Bond by Tasks**

**Issue 11 – Bond**

Use of a flat 125 percent capital and O&M allowance for "Professional Services" (PS) is, in some cases appropriate, but uniform application to all tasks results in a substantial overestimate of costs. When applied to the 100-year cash flow model and reduced to a NPV, the effect is very significant. We propose task specific estimates of PS costs, and will provide bids or proposals from consulting firms as alternatives.

**Response:** DEQ reviewed the bids and proposals as part of the mandatory consultation process on the bond as required by MMRA. DEQ reviewed the proposals and modified the bonds as necessary.

**Bergstrom Letter, Comment 2: Double  
Bonding by Including Full Labor and More  
than Full Professional Services**

Tasks #5 and #7: The O&M costs for the 1300 treatment and biological treatment systems, wet meadow and upland HDS, include costs for media replacement, equipment replacement, and operational labor in addition to 125 percent for PS. These costs are included on a continuing basis. We concur that PS would be higher in the first year or two, but should drop to a low number after start-up is complete and operational experience is gained. We believe DEQ has double bonded by including full labor and more than full PS. PS costs should be reduced with time, and the double bonding should be eliminated. Again, proposals from consulting firms will be provided.

**Response:** DEQ disagrees with the suggestion of double bonding for labor and professional services. The labor costs are for the regular employee hired to maintain the site throughout the year. The professional services are for consultants, engineers, etc. needed to help the DEQ keep systems operating and do actual work beyond the capability of the maintenance person on site hired by the engineering firm retained by DEQ. DEQ reviewed the proposals from consulting firms and adjusted the bonds as needed.



**Bergstrom Letter, Comment 3: Bond for Buried HDPE Pipelines is Excessive**

Task #9: The buried HDPE pipelines have life times of greater than 50 years, and more realistically 100 years. The \$30,000 annual fee for replacement is excessive. We will provide manufacturer specifications on pipeline life in support of a reduced maintenance burden.

**Response:** DEQ has reviewed the manufacturer specifications and decided that the \$30,000 annual replacement fee is excessive. A new figure of \$7,500 would be used in the final draft bond calculations.

**Bergstrom Letter, Comment 4: Bond is Overly Conservative**

We concur that the state should have an adequate pool of money to perform the tasks specified in the plan - if needed. However, that pool should not be overly conservative in favor of the state and at the expense of the owner and operator. Unlike any other owner in Montana, TVX is fully funding the operator's aggressive reclamation effort, a significant portion of which we have already successfully completed. It is important the bond itself not become a self-fulfilling prophecy.

**Response:** DEQ reviewed the bond comments submitted by TVX and make adjustments where they were warranted. DEQ does appreciate the work TVX has completed to date, but State of Montana law requires that DEQ must hold a bond adequate to do the work in case the mine operator vacates the site. DEQ has learned from the Pegasus experience that the cost of reclamation is much greater when the State does the work compared to the costs when the mining company does the work. As major reclamation tasks are completed, TVX can apply for bond release to reduce the bond costs.

**DANA ALLEN (USEPA) E-MAIL  
Received March 21, 2001**

**Allen E-Mail, Comment 1: EPA Withdraws Arsenic Standard**

Please take into account EPA's withdrawal of the arsenic standard when responding to our No. 11 comment for TVX.

We think in the long term, the arsenic standard will still be around 10 ug/L but for now the state's standards [are] more restrictive.

**Response:** Thank you for the update. DEQ will ignore comment No. 11 in your letter.

**JOHN HOAK, E-MAIL**  
**April 20, 2001**

FYI, TVX Gold continues to suffer the tumultuous change that has characterized and plagued the company since its take-over of Mineral Hill Mine. Chairman and CEO, Eike Batista, resigned effective end March / first April. Most recent president, Cliff Davis was fired ("... will seek other opportunities..") a week or so ago. The company's share price, following a relatively recent 5:1 reverse split, hit \$.27/share yesterday on the NYSE.

My point, again, is that there are ongoing signs of profound and increasing instability in this company. If the company fails or is sold, the State of Montana could face a substantial unfunded liability for unfinished reclamation work at Mineral Hill Mine. I do not know what authority DEQ has to deal with such difficult-to-quantify risk, but I could make a strong case for regulatory creativity and exceptional caution on behalf of Montana's taxpayers. I recommend that, at the very least, you assure overkill bond coverage.

**Response:** DEQ bonds for the costs it feels are appropriate. The MMRA does not allow "overkill bond coverage". If TVX does not post the additional bond increment shown in the final draft bond calculations, DEQ could pursue an enforcement action. DEQ currently holds over \$7,600,000 in bond. No bond has been released to date. In the final draft bond calculations, DEQ will credit TVX for work completed as noted above in the Page letter, comment 4.

**FINAL ENVIRONMENTAL IMPACT STATEMENT**

**TVX MINERAL HILL MINE  
CONSOLIDATED CLOSURE PLAN**

**COMMENT LETTERS**



0300 1.01

# MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

## TVX Consolidated Closure Plan

### Draft Environmental Impact Statement

### Comment Sheet

RECEIVED

MAR 19 2001

DEPT. ENVIRONMENTAL QUALITY

Name: Miriam + Wayne Skerich

Affiliation (if any): \_\_\_\_\_

Address: 558 Jardine Rd

City: Gardiner State: MT Zip: 59030

Attach additional pages if needed.

1. I asked Frank Bergstrom, at the last meeting, for information about the mine switching from the present pine creek water system to the new Jardine Community water system. At a previous meeting we were told that we could hook up to the new system at our expense. I was told now that we could not, that it is only for the mine. We are the only house on the east side of the creek not owned by the mine. It is in the historic district. Why are we excluded?
2. We would like to know what plans are in place to ensure the cleaning up of the area around and underneath the mill, when it is taken down. What kind of testing will be done to ensure that there is no acid generating material left?

Please leave this sheet at the sign-in table or with one of the DEQ staff, or by March 20, 2001, mail to:

Patrick Plantenberg  
Montana Department of Environmental Quality  
Environmental Management Bureau  
P.O. Box 200901  
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March 15, 2001  
Mr. Patrick Plantenberg  
State of Montana Department of Environmental Quality  
Environmental Management Bureau  
1520 E. Sixth Ave.  
P.O. Box 200901  
Helena, MT 59620

**RECEIVED**

**MAR 19 2001**

DEPT. ENVIRONMENTAL QUALITY

Dear Mr. Plantenberg:

I have received the Draft Environmental Impact Statement (EIS) for the final closure and reclamation of Mineral Hill Mine. Thank you for including me on the mailing list. Below you will find my comments to the Draft EIS. I hope you find these comments helpful during preparation of the Final EIS. The five issues on which I wish to comment are Crevice Adit Water System Design, Tailing Storage Facility, 1300 Adit Drainage, Bond, and Future Land Use.

#### **Crevice Adit Water System Design**

The water discharge from the Crevice Adit is exempt from non-degradation because the water comes from an exploration activity. I feel it is necessary for the DEQ to evaluate this exemption under the current status of the tunnel. While I was the Water Treatment Superintendent at Mineral Hill Mine, I received a legal opinion as to whether the water from the Crevice Adit would always enjoy an exemption from non-degradation. The opinion was that as long as the Crevice Adit remained an exploration activity, it would be exempt from non-degradation. If, however, the status of the tunnel changed from an exploration activity either by becoming part of the operating permit or by final reclamation, then the water flowing from the Crevice Adit would no longer be exempt from non-degradation. Apparently the intent of the law as passed by the legislature was that exploration activities were short duration so exempting them from non-degradation would not have long-term effects on water quality. It was never the intent of the legislature that this exemption would apply to long term discharges. If the non-degradation exemption stands under your review this would set a precedent of once non-deg. always non-deg.

From the Draft EIS it obvious the Crevice Adit will not have a hydraulic plug, but rather water will flow from the tunnel indefinitely. My concern is the almost flat profile of the Crevice Adit (0.3% from the portal to the intersection). The water will freeze if allowed to gravity flow. The water doesn't freeze now because it is pumped, but as anyone who has done plumbing in Montana knows, a 3.5" drop in 100 feet of pipe is grossly inadequate to keep the pipe from freezing if it flows by gravity. Since so much of the plan requires this water for dilution (if allowed), it is important that this water be available.

#### **Tailings Storage Facility**

The seepage quality of the TSF after the biological treatment system is still of concern to me. This water is required to meet non-degradation. There is no disputing this fact. The effluent referred to as semi-treated,



doesn't even meet human health standards for arsenic and several other constituents. I was surprised that even before the draft EIS was issued, the DEQ had already given approval to construct the full scale system even though this treatment has proven ineffective.

The wet meadow Habitat Development Site (HDS) is designed for total utilization of the water from the biological treatment system. My fear again is that during the winter, the HDS will be nothing more than a frozen mass of contaminated water which will flow uncontrolled during spring run off. This problem must be addressed.

Under the plan, if the HDS can not utilize all the effluent from the biological treatment system, then the effluent will be diluted with Crevice Adit water. Dilution is not the solution to pollution. More importantly, dilution is not treatment. I dealt with the DEQ on water quality issues, so it amazes me to see you propose dilution as a treatment. Since EPA does not allow dilution instead of treatment, I do not understand how the DEQ can propose this as a solution. This issue is not just a hand-wringing, fussy concern on my part. The issue of dilution instead of treatment goes to the core of our water quality laws in this country. DEQ needs to address this in the final EIS. Please do not ignore this issue just because it comes from me.

If the DEQ decides to allow dilution of the TSF effluent with Crevice Adit water, then the mixed stream must meet non-degradation. Again, there is no disputing this. If effluent water that must meet non-degradation is mixed with effluent water that is exempt from non-degradation, then the resulting flow must all meet non-degradation. This is not new information; I have been through this with the agency before. The agency's comment that the standards for Outfall 006 would be the same as Outfall 001 is in violation of Montana's non-degradation law. In addition, dissolved concentrations and total recoverable concentrations are used interchangeably in the proposed permit. This must also be resolved.

### **1300 Adit Drainage:**

Since treatment of the 1300 Adit Drainage is required, then I agree with the DEQ that monitoring of effluent is necessary. In addition, I feel it would make more sense to construct a separate drain field for this effluent instead of using the existing septic drain field. I see no reason to flush the nitrates from the existing drainfield, any faster than will occur naturally. A new drain field is inexpensive and should work better than the existing one. Additionally, EPA is changing the human health standard for arsenic. Will this change affect the discharge permit for Mineral Hill?

### **BOND:**

I have one main issue that needs addressed under bonding. The Crevice Tunnel is well designed, and was constructed by some of the finest miners in the world. I should know: I was the Crevice Project Superintendent before the shutdown in 1996. That said, the Crevice Tunnel was not designed or constructed to remain standing beyond the design life of 10-15 years. Unlike civil tunnels, mine tunnels have a short design life. This is done primarily for economics, because it doesn't make sense to have a tunnel with a design life longer than the mine itself.

Under the closure plan, the Crevice Tunnel will be used for ingress and egress of personnel for the next 100 years. Without extensive, ongoing maintenance the tunnel is unlikely to remain open for even the next 10 years. The first 200 feet of the tunnel goes through a large fault. This is why there are steel sets in that first section. In addition there are several smaller faults further in the tunnel. The ground is supported primarily by split set bolts. Because of wet conditions in the tunnel, these bolts will succumb to rust resulting in failure of the ground support system.

There should be a bond in place for the complete rehabilitation of the tunnel every 10 years. In addition money should be set aside as insurance against a catastrophic failure as a result of seismic activity in the region. We know from experience that many of the tunnels collapsed in the Mineral Hill and Crevice district as a result of the 1959 Hebgen Quake. There is a good probability another quake of this magnitude could be expected in this area over the next 100 years.

I realize this should have been covered during the EIS scoping, but I never imagined the DEQ would buy off on leaving the tunnel open rather than installing a hydraulic plug. But since TVX and DEQ seem set on leaving the tunnel open, then adequate bonding should be in place to cover this significant cost.

### **Future Land Use**

I have concerns over TVX's proposal to "donate" Mineral Hill to the USFS. Believe me, nobody wants to see TVX leave our community, our state, and our country worse than I do. But I don't want to see them leave at the expense of the taxpayers. Regardless of how well the property was managed, there are environmental liabilities that currently exist. It is a fact that water treatment will continue indefinitely. There is CERCLA liability in connection with the tailings impoundment, and there is considerable maintenance that will be required.

The post closure land use should not include residential sub-division. Even the hint that TVX might consider this option is irresponsible. The original EIS and the draft EIS both exclude residential sub-division as an option. Regardless of whether TVX retains ownership of the property or if the ownership is transferred to the USFS, residential sub-division should not be allowed.

The land transfer should not take place until reclamation is completed and there are 5 years of post closure monitoring by TVX. At that time the USFS should perform an EIS to determine the impact of the "donation" along with a complete environmental audit of the property. If the USFS decides to continue with the transfer, then TVX should donate the land and provide money for the treatment of water, monitoring, and on going maintenance in-perpetuity.

Thank you for the opportunity to discuss my concerns. I look forward to seeing my comments incorporated into the final EIS.

Sincerely,



Joe McPhie

Civil/Environmental Engineer

cc. Richard Parks (Bear Creek Council), Mary Hektner (Yellowstone National Park), John Wardell (Environmental Protection Agency)



March 16, 2001

Patrick Plantenberg  
Montana Department of Environmental Quality  
Environmental Management Bureau  
PO Box 200901  
Helena, Montana 59620-0901

**RECEIVED**

MAR 19 2001

DEPT. ENVIRONMENTAL QUALITY

Re: Draft Environmental Impact Statement-TVX Mineral Hill Mine

Dear Mr. Plantenberg:

Following are comments and questions regarding the Draft EIS for Mineral Hill Mine.

**General Comments**

A) I have grave concerns about TVX's plan to donate the MHM property to the Gallatin National Forest. It is my understanding that TVX has approached Montana's congressional leadership, the Governors Office, and local Park County officials to enlist their help to expedite the land transaction, including possible legislation. It is also my understanding that whenever a federal agency gets involved with a land exchange, sale, or donation it must, by law, generate an EIS and a CERCLA-based audit. By trying to legislate or otherwise expedite the transaction, the Forest Service may find themselves exempt from following established and lawful procedures. I am sure this is exactly what TVX is hoping for.

What is more disturbing is the fact that by donating the property, TVX will be released from its bonding obligations. The Forest Service then becomes responsible for all the long-term monitoring and maintenance (M & M) of the site. However, it is not the Forest Service who is ultimately responsible, but the tax-paying public who becomes responsible for the M & M and all future liabilities. TVX and the Forest Service have three viable options as I see it:

1. TVX can donate the property to the Forest Service along with a check for \$20 million to cover all future contingencies;
2. TVX can donate the property to the Forest Service but honor all their stated commitments and bonding obligations; or
3. The Forest Service should respectfully decline the whole deal if TVX will not offer 1 or 2.

The motive for TVX proposing this idea should also be examined. TVX is not donating the property because they are a conscientious mining company and want the Forest Service to establish additional elk habitat. No, TVX simply wants to walk away from their bonding obligation. After this state has endured the Pegasus Gold fiasco and the Canyon Resources fiasco, it's time a mining company holds itself accountable. Both Pegasus and Canyon have tried to ignore or minimize their accountability and obligations. Now TVX is trying to do the same thing. I imagine their response would be, "We have an obligation to all three of our shareholders." They ignore the fact that they have an even greater obligation to Montana and Park County, not to mention the rest of the mining industry. This property is only 500 plus acres. 500 acres is not worth the headaches the Forest Service/public will inherit. It is elk habitat, but it's hardly on the scale of the Royal Teton Ranch transaction.

B) The approved reclamation action for the TSF is based on the EDYS Model. Since there is very little supporting data (e.g., calibration and sensitivity data) to confirm whether model assumptions and conclusions are correct, I guess the public has to take Shepard-Miller's word. I have no doubt that the model is correct and a big improvement over the HELP Model, but I'm a little suspicious of a model that is proprietary to one consulting firm. The term, "self-serving" comes to mind.

C) Throughout the Draft EIS, there is very little information on TVX's Monitoring & Maintenance Plan. General statements are made to the effect that M & M will be part of the final reclamation plan and bonding will be done accordingly. However, there is not enough detail to ascertain if the M & M Plan will be effective to ensure compliance with permit stipulations and to maintain the long-term integrity of the infrastructure (pipelines, pumps, etc.). It is clear that there will be a great deal of post-closure monitoring, water treatment, and maintenance of infrastructure. What is more disturbing is that TVX has stated all the M & M tasks will be accomplished by one part-time employee (Issue 7, Applicant's Proposed Plan, page 30, 4<sup>th</sup> ¶). The proposal to have one part-time employee hardly instills a sense confidence that at 3:00 AM and 30 below a broken pipeline spilling water all over the place is being attended to. How can one part-time employee manage to be everywhere every time he/she is needed? What if the person wants to go see a movie or go on vacation? Let's get real.

Other M & M issues include:

- Maintaining a potable water system for Jardine will require a certified operator. Assuming that this part-time employee is certified, what happens when he/she decides to find work elsewhere? How will TVX address this situation?
- The EPA may promulgate regulations requiring primary treatment (chlorination) of potable water from underground sources. If this happens, how will TVX address this issue of new regulations or amendments to existing regulations?

- Operating water treatment and distribution systems in the winter is problematic at best. How can TVX ensure that all the right pumps and all the right valves are turned on/off at all the right times?

In other words, TVX must submit a comprehensive M & M Plan detailing the how, what, when, who, and where of the long-term monitoring and maintenance tasks. Having plans for everyday operations, assorted contingency plans, and adequate bonding is all well and good, but unless the plans can be implemented in the proper manner at the proper time, then the plans become empty-headed rhetoric.

*TSF Seepage Management, Page 9:*

- How will precipitate from the multiple-stage process be handled and disposed of (M & M)?
- Are agronomic rates predicted just for the amount of effluent expected from the TSF, or were agronomic rate predictions inclusive of the maximum amount of Crevice Tunnel water expected for dilution purposes (TVX Contingency Plan)? How realistic are estimated agronomic rates considering the heterogeneity of the glacial till underlying this area? And exactly when has dilution been accepted as a treatment option, at least by EPA standards?
- Assuming agronomic rate predictions are reliable, what about long-term metals attenuation rates? At what point, if ever, will the soil not attenuate or adsorb metals? What is the Fate & Transport of nitrogen in this system, particularly regarding cyanate and thiocyanate?
- One of the myths about wetlands is that they are a "walk-away" solution to water treatment. This is not the case. There is no mention of wetlands maintenance or mention of sludge/precipitate/evaporate disposal (M & M). In addition, the statement, "Effluent from the biological system would be evapotranspired by the wet meadow vegetation, which would in turn produce more biomass as a result of the supplemental water source." This statement is non-sensical and contradictory. It does not seem as if this supplemental water would be around long enough to enable more biomass to develop, nor would this supplemental water be pumped to the site often enough if the HDS treats water as well as TVX has claimed.
- What are the regulatory issues regarding the mixing of streams? Does not the inclusion of Crevice Tunnel water with TSF effluent change the standards by which the Crevice Tunnel water is regulated (non-degradation)?
- It was my understanding that Crevice Tunnel water was exempt from non-degradation review because the Tunnel was permitted under an Exploration License. It was also my understanding that once Upper Crevice came under the Operating Permit, or the mine went into closure, the non-degradation exemption would no longer apply.

- How will precipitate be disposed of (M & M)? Assuming that the septic system will remain operational for at least some period of time, is mixing septage with metals laden precipitate allowed under law? Will the two materials be co-mingled? This needs further explanation. Will not the addition of a steady state flow of 15 gpm, not to mention flow rates during spring and early summer, overwhelm the existing drain fields? Leachate from the upper drain field has been known to surface, as a spring, just above the Old Tailings North. Is that situation allowable under the law?

Some of these issues were brought up during the scoping process and since I am repeating some of my questions and concerns, I am either missing information or these issues have just not been addressed properly. I would appreciate some enlightenment before the Final EIS is written. Thank you for the opportunity to respond.

Sincerely,



Stephen R. Monninger

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RICHARD A. PRODGERS

— Plant Ecologist —

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RECEIVED

MAR 21 2001

March 17, 2001

DEPT. ENVIRONMENTAL QUALITY

Dear Mr. Plantenberg:

Thanks for this opportunity to comment on the DEIS for the mine closure plan at the TVX Mineral Hill Mine. Amerikanauk Inc. and I have discussed the revegetation plan for mine closure. I believe that it will be more complicated and more effective than my previous comments indicated because they applied to one of three types of upland revegetation types contemplated for Mineral Hill.

My comments on revegetation as they appear in the DEIS related to the 450 audit area. This old mine audit is surrounded by Douglas-fir forest. The disturbance area is about 2.6 acres on a west-facing slope of 35%, a little steeper toward the bottom. The coversoil material was cast downhill during the original audit construction and recently pushed back uphill. This substrate is suitable for trees, and there is ample evidence that trees will volunteer in years of good seed crop and suitable weather.

This is one of three types of revegetation appropriate for upland sites. Where tailings underlie coversoils, the objective of erosion control remains, but maximum evapotranspiration is also important. In the long run, forest probably has the highest transpiration (+ interception) of any vegetation type, but it will take a few decades to realize this potential. In the short term, grass-forb revegetation will largely determine evapotranspiration. Fertility, including nutrient cycling, drives primary productivity, which correlates with evapotranspiration. Since nitrogen is used in greatest quantity and usually limits productivity, nitrogen fixation will be a component of revegetation. Although I have not yet drafted revegetation plan, I suspect that the grass-forb component of tailings revegetation will establish a highly productive, competitive plant community that withdraws a lot of water from the four-foot-thick coversoil.

Isn't tree establishment often deterred by competition with established, competitive herbs? Just so, although the herbs will be only one season old when Douglas firs are transplanted. Once the herbs are established, their roots and above-ground litter will hold the soil even if the plants are dead — a good thing, since we may kill some of them. At the site of each seedling transplant, a woven polypropylene mat will be placed on the ground with the seedling in the middle. (This suggestion has not yet been ruled on by Amerikanauk Inc., so it is tentative.) The mat is stapled at the corners and near the seedling. The fabric allows passage of water, perhaps more so if a needle-punctured mat

is used. Herbs under the mat die due to lack of sunlight, and the conifer seedlings get a lot of resource to grow on. This is the anti-competition element of the tailings revegetation strategy. Summing up, the idea is to prevent erosion and promote evapotranspiration in the early years with productive herbs, and later with trees. As the trees mature, the weed problem will meliorate.

The other type of upland revegetation is of the grass-forb or grass-forb-shrub type. Objectives have not been fully determined, but short-term erosion control and deterrence of weeds are sure to be among them. I mention this only to alert you that a third type of revegetation is contemplated.

I realize that in requiring that a specialist prepare a revegetation plan under the Agency Modified Plan, you realize that my report in Appendix B-1 was not the whole revegetation plan. My hope is that you now have an indication of where this is headed.

Yours,

  
R. A. Producers

**Nicolay, Jade**

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From: Plantenberg, Pat  
Sent: Monday, March 19, 2001 3:32 PM  
To: Nicolay, Jade  
Subject: FW: DRAFT TVX Bond

another tvx comment

-----Original Message-----

From: David Chambers [mailto:dchambers@csp2.org]

Sent: Wednesday, March 14, 2001 4:30 PM

To: Freshman, Charles

Cc: pplantenberg@state.mt.us

Subject: Re: DRAFT TVX Bond

Charles:

Thanks for the copy of the bond calculation. I have a couple of minor questions for you on the 'Water Treatment' sheet:

1. Under Capital Costs, Task 3, line 78 - labor/equipment costs are listed as \$100/well. This only allows a couple of hours of work to complete the task. Did you mean \$1000/well?
2. Under O&M, Task 5, Biological Treatment System - Is the cost for the carbon source included or insignificant? I didn't see it noted.
3. Replacement & Demolition Costs - Why didn't you apply Indirect Costs to these items?
4. I would like to look at the sensitivity of the NPV to the assumed inflation and discount rates. When I talked to Pat Platenburg, he indicated that it might be possible to get a version of the spreadsheet that wasn't locked/protected, so I could test this. Is it possible to get a version of the file that isn't locked, or to get the password to unlock the spreadsheet?

Thanks;

David M. Chambers  
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# CENTER for SCIENCE in PUBLIC PARTICIPATION

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"Technical Support for Grassroots Public Interest Groups"

# CSP<sup>2</sup>

March 19, 2001

Patrick Plantenberg, Operating Permit Section Supervisor  
DEQ, Environmental Management Bureau  
P.O. Box 200901  
Helena, MT 59620-0901

## Re: Comments on TVX Mineral Hill Draft Environmental Impact Statement

The Center for Science in Public Participation would like to submit the following comments for consideration in the Final EIS:

### 1. Chapter 3 – Seepage Quality (p.20)

The EDYS modeling predicts evapotranspiration to be 469,000 gallons per year, equivalent to 0.9 gpm annually, in the Seepage Collection Pond (SCP) [p. 20]. The SCP will be converted to a Habitat Development Site (HDS) by filling in the present SCP to create a half-acre wetland.

Since it is possible for this wetland to overflow in wet years, it is important to know what volume of water the converted SCP/wetland will hold.

*Please discuss the volume of the SCP/wetland in this section. The capacity of the HDS should be sufficiently large to accommodate all but the largest stormwater events.*

### 2. Chapter 3 – Issue 11 – Bond (p. 39)

- a. Calculation of a bond is a very complicated procedure. Because it involves not only mathematical modelling, but also a number of critical assumptions (including the rate of inflation and the discount rate), it is appropriate to perform some sensitivity analysis to test the possible consequences of the assumptions. This is information that can be discussed quite easily, and non-technically, in the EIS.

*The sensitivity of critical assumptions made for the bond calculation, including the inflation and discount rates, should be discussed in the EIS.*

- b. At the 100-year mark, the net present value (NPV) of the bond for the Capital and the Operating & Maintenance Costs is still approximately \$28,000. [see tvx\_2001\_agency-2.xls, 'Water Treatment,' line 466] Since there is no technical rationale presented for choosing 100 years as the cutoff time for treatment and monitoring, carrying the bond calculation beyond 100 years would still add significantly to the NPV (i.e. the net liability to DEQ and Montana taxpayers) of the bond. It would fiscally prudent to carry the bond NPV out to a time when the NPV for each additional year is irrelevant.

*It is recommended that the bond be calculated until the net present value of the Capital and the Operating & Maintenance Costs are less than \$1000 in the final year of the calculated bond, instead of terminating the calculation at 100 years.*

- c. A significant part of the reclamation work for the several of the reclamation sub-areas, including 'Facilities,' and 'Waste Dumps,' assumes labor costs taken from a column titled "TVX-Mineral Hill Equipment Cost Summary." The rate listed for a (1) laborer is \$26/hr; (2) a laborer with truck is \$32/hr; and, (3) a superintendent with truck is \$60/hr. There is no explanation of how these rate estimates were calculated. [see tvx\_2001\_agency-2.xls, 'Labor & Equipment,' lines 97-99]

*Is DEQ confident that, if required, it could hire personnel and completely cover its costs if it were forced to manage the reclamation itself if TVX were not able to continue its management (or Amerikanuak's involvement) of the project?*

- d. If DEQ has to assume direct responsibility for reclamation of the site, the cost of site management during reclamation has been estimated as \$250,000/yr for 2 years. The bond estimate states "A third party engineer is expected to cost \$250,000 per year. The \$250,000 includes labor, power, insurance, taxes, leases, vehicles, computers, and etc." [see tvx\_2001\_agency-2.xls, 'Post Mine']

*Please discuss what the assumptions, or experience, this cost estimate is based on.*

- e. In the spreadsheet tvx\_2001\_agency-2.xls, 'Capital Costs,' Task 3, line 78 - labor/equipment costs are listed as \$100/well. This only allows a couple of hours of work to complete the task.

*Were labor costs meant to be \$1000/well?*

- f. In the spreadsheet tvx\_2001\_agency-2.xls, 'O&M,' Task 5, Biological Treatment System:

*Is the cost for the carbon source included or insignificant? I didn't see it noted.*

- g. In the spreadsheet tvx\_2001\_agency-2.xls, 'Replacement & Demolition Costs'

*Why aren't Indirect Costs applied to these items?*

### 3. Appendix C – Draft MPDES Permit

#### a. Stormwater overflow of the HDS – not presently included

Since the Habitat Development Sites contain effluent that could overflow in the event of storm events, it would be appropriate to require, as a part of the stormwater plan/permit, sampling of any overflow that enters Bear Creek.

*Require sampling for arsenic in any overflow from either HDS if the overflow enters Bear Creek.*

#### b. Sampling at Outfall 005B (p. C-FS-12)

It is proposed that yearly sample of the effluent from the dosing chamber be collected and sampled for total and dissolved arsenic to insure that precipitated arsenic is not being remobilized or introduced into the discharge. Yearly sampling will not yield much in the way of meaningful data. More frequent monitoring would not only provide more meaningful data, but would also be more likely to detect seasonal effects on the treatment system.

However, since Outfall 005B is the final point in the treatment system before discharge to groundwater, it would seem that this point, rather than Outfall 005A – after chemical treatment – would be the appropriate point at which to conduct compliance sampling. If it is impractical to sample at 005B on a monthly basis, as is being proposed for 005A, then 005B should be sampled quarterly, as with Outfall 001.

*Outfall 005B should be sampled on a monthly, or at least quarterly, schedule.*

Thank you for the opportunity to comment on the Draft EIS.

Sincerely;



David M. Chambers



# Greater Yellowstone Coalition

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March 13, 2001

Montana Department of Environmental Quality  
Environmental Management Bureau  
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Helena, MT 59620

**RECEIVED**

**MAR 20 2001**

DEPT. ENVIRONMENTAL QUALITY

Attn: Patrick Plantenberg

Re: TVX DEIS

Dear Pat:

The following are comments submitted on behalf of the Greater Yellowstone Coalition concerning the adequacy and accuracy of the Draft EIS for the TVX Mineral Hill, Inc (TVX) Mineral Hill Mine Consolidated Closure Plan.

We are generally pleased with the document, and appreciate that DEQ acknowledged that the EIS process should lead to a more comprehensive and protective closure strategy for the Mineral Hill Mine.

We support the Agency Modified Plan as the preferred alternative, but condition this support on the following comments relating to the monitoring and maintenance.

**Issue #1.** Tailings Storage Facility (TSF) - Biological Treatment System, Cap Design

The EDYS model verification (pg. 18) is based on empirical evidence of Douglas fir survival over a 10 year period, and an intentional single year experimental plot. Previous MHM proposals that were the basis for DEQ analysis indicated the water balance cap would function with revegetation of grass and forbs. A later iteration included grasses, shrubs and trees, but grass still predominated. We understand and appreciate that "DEQ believes dominance of a Douglas fire community ... would reduce the amount of seepage through the TSF..." and hope confidence will be demonstrated though attention to Appendix B, the Producers/Bighorn Environmental Sciences Report, 9/19/00.

The unfolding vegetation plan demonstrates the uncertainty of the TSF capping solution. This uncertainty speaks to the need for a comprehensive monitoring plan that would integrate vegetative growth and cover measurement, climatic and weather event measurement and continuous seepage quantity measurement. To accomplish this, TVX must install instrumentation that would log those parameters that are vital for verification of both the EDYS model and further hydrological monitoring. The original HELP model should be included in the verification plan as well as the more sophisticated modeling suggested on pg. 18. An annual monitoring report should be filed with DEQ and noticed for public review. The DEIS, at Issue



#5, suggests annual measurements, while we believe continuous measurements should be employed in the monitoring. Technology is readily available for this measurement program.

**Issue # 7.** (pg. 29) Future Land Use

There is also uncertainty in the future land use of the MHM property. The Greater Yellowstone Coalition supports the intent of the proposed donation of this property to the US Forest Service. The Final EIS should include land use plans for the TVX property should the donation not be consummated. Regardless of how property ownership is settled, there should be provisions for an office and other space to be utilized in conjunction with monitoring and maintenance activities.

**Issue # 9** Revegetation

As stated in Issue #1, the TSF cap design is dependent upon a functional revegetation program. The difficulty of high elevation reclamation is well known, and this site represents a high and relatively dry environment subject to seasonal climatic extremes. We support the DEQ requirement that Prodder's revegetation recommendations be followed. Monitoring and response to failure must be a clear element of the final plan. Revegetation of waste rock and other disturbed areas must also be monitored. Some revegetation issues will be noxious weeds, survivability, functionality (TSF cap design), wild life damage, mulch and amendments (if necessary) and revegetation maintenance (gardening).

**Issue #11.** Bonding.

Dr. David Chambers will submit comments on behalf of GYC regarding the issue of bonding.

It appears that this EIS and the Mineral Hill Mine Consolidated Closure Plan represents the best effort to comply with applicable federal and state laws and regulations. The success of the proposed plan is dependent not only on the work to be performed, but on a committed monitoring and maintenance program.

Please send GYC the Final Environmental Impact Statement, and all future monitoring and maintenance reports.

Sincerely,



Don Bachman

Cc: Bear Creek Council  
Center for Science in Public Participation



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 8  
999 18<sup>TH</sup> STREET - SUITE 300  
DENVER, CO 80202-2466  
<http://www.epa.gov/region08>

March 20, 2001

COPY

Ref: 8EPR-EP

RECEIVED

MAR 23 2001

Patrick Platenburg  
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Montana Department of Environmental Quality  
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Helena, Montana 596200 - 0901

DEPT. ENVIRONMENTAL QUALITY

Re: TVX Mineral Hill Mine Closure  
DEIS Comments

Dear Mr. Platenburg:

The Environmental Protection Agency (EPA) - Region 8 has reviewed the *Draft Environmental Impact Statement for the Closure of the TVX Mineral Hill Mine* near Jardine, Montana. Overall, the State of Montana and the applicant have done a good job of specifying closure plans and contingencies. We have the following comments or questions:

**Tailings Storage Facility (TSF)**

1. What is the regulatory mechanism by which TVX Mine will be legally obligated to continue to utilize the existing reverse osmosis (RO) wastewater treatment system to treat tailings pond effluent until flows drop below 1.0 gpm and the proposed four-stage biological treatment system has been proven effective? Is there a regulatory approval necessary for the applicant to change from the existing treatment system such a provision of the mine operating permit?
2. It is unclear if there are any permit limits or performance specifications that apply to discharges from the biological reactors. It appears from the draft MPDES permit that the discharge limits for the RO treatment system for outfall 002 will no longer apply after successful start-up of the biological treatment system. We recommend that the discharge quality and flow from the biological reactors continue to be limited under an MPDES permit. Through the MPDES permit, TVX should also report the use of the upland Habitat Development Site and the other contingency alternatives.
3. For final disposal of the treated tailings pond seepage in the meadow evaporation system(s), is there likely to be a buildup of any deleterious constituents in the soil or vegetation over time? Were there any study or long-term forecasts of possible accumulation of conservative substances (e.g., metals or metalloids) in either wet meadow substrate or in subsequent vegetation? Is this possibly a long-term concern?

4. Are any geochemical changes likely in the tailings pile over time as caps are put in place and drain down continues? Will any changes in valence or oxidation conditions lead to mobilization of constituents presently geochemically bound in place? Any such changes, if significant, could require changes in the wastewater treatment unit processes. Will there be any significant quantities of metal-sulfide precipitation sludges generated over time from this treatment system that will constitute operation and maintenance concerns?

#### **Habitat development sites (HDS)**

5. We recommend that a performance monitoring well be installed below the wet meadow HDS. We recognize that this is designed to be a non discharging facility (especially with the Agency contingencies); however, there are always design and operational uncertainties. This well does not necessarily need to be a compliance outfall in the MPDES permit but installing this well and requiring that it be monitored as a performance monitoring location should be an MPDES requirement.

#### **Crevice Adit Water System Design**

6. The DEIS does not contain any water quality data for the Crevice adit discharge. A table similar to that for the 1300 Adit discharge (Table 3-6) should be included.
7. Will the Crevice adit water system design be adequate if the total discharge from the Crevice adit cannot be reduced to 200 gpm? We recommend that the discharge structures/pipes be sized for the higher historic flows. Also, if the inflow to the Crevice adit is reduced by plugging draining drill holes - what is the chance of the water discharging somewhere else and requiring an MPDES permit?

#### **1300 Adit Drainage**

8. How will the sludge/precipitant be disposed of from treatment of the adit discharge from the 1300 Portal? The DEIS indicated there will be a minimal amount of residual from the arsenic co-precipitation by the ferric sulfate; however, the EIS does not discuss disposal. How frequently does TVX anticipate sludge removal, yearly, every ten years? We also have concerns that the arsenic/iron precipitant could be pumped out and disposed of as domestic septage. It is also unclear from the EIS if any domestic users are still connected to the septic tanks and drain fields.
9. Is there any probability that chemical precipitation residues will accumulate in either of the proposed drainfields located downstream of the ferric sulfate treatment system for the 1300 Portal? If these drainfields might become clogged by chemical precipitation residues at some point in time, is there any mechanism proposed to clean or rehabilitate them? What is the overall life expectancy of such a system? Are replacement costs factored into the operations and maintenance calculations?
10. We recommend monitoring of the 1300 adit discharge more frequently than once per year

(after it leaves the chemical addition building and before it leaves the dosing tank). We recommend quarterly monitoring to provide data to evaluate treatment levels and catch malfunctions within a reasonable time.

#### **Arsenic Standard Change**

11. EPA promulgated a revised MCL for Arsenic on January 22, 2001, of 0.01 mg/l (10 ug/l). Is this regulatory change going to affect the Montana ground water standard of 0.02 mg/l? In the past, Montana ground water standards were generally expressed as a percentage of promulgated MCL's under the Safe Drinking Water Act. The Final EIS needs to explain the significance of this regulatory change, if any.

#### **UIC Permit**

12. The EIS should discuss the UIC site specific permit now being issued by the MT office of EPA. It is mentioned on page 5 of the EIS this may be required - but there is no discussion about the fact that a site specific permit is being issued for the 1300 adit discharge.

#### **Bond**

13. The DEIS mentions that the existing bonds are irrevocable letters of credit. However, the DEIS does not describe the bond vehicles for the water treatment and contingency bonds. This information should be added to the FEIS.
14. As we understand bonding arrangements, letters of credit are contracts with banks to pay under certain conditions. It would be helpful to include in the FEIS a discussion of the types of conditions and level of proof that would be necessary to receive payments from the bank on the letter(s) of credit.

#### **Groundwater**

15. The plan to address the high nitrate in well MW-10 that has been approved should be discussed in more detail in the FEIS. The plan, as we understand it, is to wait to see if the concentration in MW-10 declines to less than 10 mg/L. For example, at what nitrate concentration or time limit will TVX need to take additional action?

## Editorial Comments

16. Page ES-2 the Crevice Adit Water System Design should be issue **3**, not 2.

Thank you for the opportunity to comment. If we can further explain our comments, please call me at (303) 312-6870.

Sincerely,



Dana B. Allen  
Environmental Engineer  
Ecosystems Protection and Remediation

cc: Sherman Solid, Forest Service  
Stephen Potts, EPA MT  
Arnold Boettcher, EPA MT

March 19, 2001

COPY

Patrick Plantenberg  
Montana Department of Environmental Quality  
Environmental Management Bureau  
P.O. Box 200901  
Helena, MT 59620-0901

RECEIVED

MAR 21 2001

DEPT. ENVIRONMENTAL QUALITY

Dear Sir,

Thank you for the opportunity to respond to the TVX Consolidated Closure Plan Draft EIS. This mine has been a good example of how mining can be done with concern for the environment and the local community. I hope that the final closure and future management of the site is done in the same manner.

My first concern is that initially there was not going to be an EIS done on this mine closure. With the changes that have come about since the first closure plan it is obvious that the scoping process and EIS was very much needed and that MEPA is a viable and workable tool.

Another concern of mine is the fact that the Biological Treatment System and Cap Design for the tailings pile has not been tested anywhere. To allow tree roots to invade the tailings directly in hopes that the root system will absorb all the water that infiltrates the tailings pile goes against standard reclamation practices. I hope that if this design does not work that an alternative plan has been thought of to manage this problem.

The mine site contains Bitterroot plants, which are a protected plant in the state of Montana. It would be good if these plants can be protected during the restoration process. I know that a small group of them have been identified and marked to protect them from being disturbed. I hope to get permission from the mining company to go to the site in June, while the Bitterroot are in bloom, and mark them so they can be left to grow undisturbed.

Finally, I am not sure how long the liner used to contain the tailings is suppose to last or what the long term picture is for these former mine sites. I can only presume that there will still be high levels of arsenic and heavy metals to be dealt with.

Thank you again for your time and consideration.

Sincerely,

*George Nell*

George Nell







P. O. Box 448 — Gardiner, Montana 59030

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RECEIVED

MAR 21 2001

DEPT. ENVIRONMENTAL QUALITY

March 20, 2001

Patrick Platenberg  
Montana Department of Environmental Quality  
Box 200901  
Helena, MT 59620-4960

Dear Pat,

Bear Creek Council wishes to submit the following comments on the Draft EIS for the Consolidated Closure Plan for the TVX Mineral Hill Mine.

First of all we are pleased the Department actually wrote this document and reviewed the closure plan for the mine in one comprehensive document. Through this process we have seen the proposal for handling the various mine discharges change and improve significantly.

We support the Department's Agency Modified Plan, but we would like to see some changes and amendments to what has been presented in the document. Our comments follow.

Building on the concerns expressed by Bill Edwards and Richard Parks at the public hearing, we concur with the Agency recommendation that the applicant incorporate the suggestions contained in the Producers report and hire a revegetation specialist, experienced in mined land reclamation, to design, oversee and then monitor the progress of the revegetation efforts at the TSF as well as throughout the mine property. Bonding for the revegetation efforts should be increased to at least \$2500 per acre, and we concur that a monitoring plan needs to be devised by which to judge the success of the revegetation efforts. The plan must include the flexibility to revise revegetation methods if preliminary monitoring shows poor results.

Bear Creek Council strongly supports the idea of transferring the mine property to the Forest Service. At the public meeting, it came out that negotiations were under way with our congressional delegation for special legislation to make such a transfer possible. We support that effort, but would like to see a commitment in the CCP to a contingency that



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would include wildlife habitat, public access and recreation as preferred future uses of the land in case transfer to the Forest Service does not happen.

The CCP speaks of creating a potable water and fire water supply available to the historic district of Jardine from the Crevice Adit water. The Skertiches, who live in the historic district adjacent to the mine property on the east side of Bear Creek have expressed interest in tapping into that water supply. Their ability to do so, running the pipe to the water supply tank at their own expense, has been assumed. We would like to have the availability of that water affirmed in the final plan. This water would be a superior source of clean drinking water for their household. In addition, their use of the water would help keep water moving through the system, which would decrease the amount of discharge to Bear Creek and help with freezing problems in the winter months.

The Department needs to include a schedule for bond release that would clearly show the anticipated closure thresholds to be met and bond amounts to be released.

Our comments also incorporate the comments made at the public meeting in Gardiner by Richard Parks, Bill Edwards, Miriam Skertich, George Nell and myself. We look forward to seeing the final document, and we would like to receive maintenance and monitoring reports as they are available.

One additional thought: between 1989 and 1993, Bear Creek Council conducted a aquatic macroinvertebrate study utilizing sites on Bear Creek above and below the mine and on the Yellowstone River above and below the mouth of Bear Creek. The reports from that work were sent to the then Department of Health and Environmental Sciences in 1995 (we have copies also) and serve as a baseline view of the health of those streams at that time.

Again, we appreciate the Department's work in preparing this draft EIS for the TVX closure plan.

Sincerely,



Julia Page  
President

# TVX Mineral Hill Mine

Operated by **Amerikanuak, Inc.**

---

PO Box 92 • Gardiner, Montana 59030-0092  
Telephone: (406) 848-7421 • FAX (406) 848-7935  
aki@montana.com

March 20, 2001

Pat Plantenberg  
Montana Department of Environmental Quality  
P.O. Box 200901  
Helena, Montana 59620-0901

RE: Comments on Draft EIS on the TVX Mineral Hill Mine Consolidated Closure Plan Modifications, February 12, 2001.

Dear Pat:

Amerikanuak is pleased to present the following comments on the above referenced document. In general, DEQ has prepared a very comprehensive analysis of our closure plan. We are taking this opportunity to comment on the bond calculation contained therein, but may wish to discuss this and other issues with the agency at a later time.

## Issue 11 – Bond

Use of a flat 125% capital and O&M allowance for "Professional Services" (PS) is, in some cases appropriate, but uniform application to all tasks results in a substantial overestimate of costs. When applied to the 100-year cash flow model and reduced to a NPV, the effect is very significant. We propose task specific estimates of PS costs, and will provide bids or proposals from consulting firms as alternatives.

Tasks #5 and #7 The O&M costs for the 1300 treatment and biological treatment systems, wet meadow and upland HDS, include costs for media replacement, equipment replacement, and operational labor in addition to 125% for PS. These costs are included on a continuing basis. We concur that PS would be higher in the first year or two, but should drop to a low number after start-up is complete and operational experience is gained. We believe DEQ has double bonded by including full labor and more than full

Mr. Pat Plantenberg

March 20, 2001

Page 2

PS. PS costs should be reduced with time, and the double bonding should be eliminated. Again, proposals from consulting firms will be provided.

Task #9 The buried HDPE pipelines have life times of greater than 50 years, and more realistically 100 years. The \$30,000 annual fee for replacement is excessive. We will provide manufacturer specifications on pipeline life in support of a reduced maintenance burden.

We concur that the state should have an adequate pool of money to perform the tasks specified in the plan – if needed. However, that pool should not be overly conservative in favor of the state and at the expense of the owner and operator. Unlike any other owner in Montana, TVX is fully funding the operator's aggressive reclamation effort, a significant portion of which we have already successfully completed. It is important the bond itself not become a self fulfilling prophecy. We look forward to the final EIS.

Sincerely,

via email /s/

Frank Bergstrom  
General Manager

cc: Greg Laing

**-----Original Message-----**

**From:** Allen.Dana@epamail.epa.gov [mailto:Allen.Dana@epamail.epa.gov]

**Sent:** Wednesday, March 21, 2001 6:48 PM

**To:** pplantenberg@state.mt.us

**Cc:** Dunn.James@epamail.epa.gov; Wireman.Mike@epamail.epa.gov;

Potts.Stephen@epamail.epa.gov; Boettcher.Arnold@epamail.epa.gov

**Subject:** TVX & Bush undoing arsenic standards & reqts for mining

**Please take into account EPA's withdrawal of the arsenic standard when responding to our No. 11 comment for TVX.**

**We think in the long-term, once they get done hemming and hawing, the arsenic standard will still be around 10 ug/L but for now the state's standards more restrictive. Thanks**



**Plantenberg, Pat**

---

**From:** McCullough, Warren  
**Sent:** Monday, April 16, 2001 9:48 AM  
**To:** Plantenberg, Pat  
**Subject:** FW: TVX Gold & Mineral Hill Mine

Do we have a category on the bond calculation marked "overkill?"

-----Original Message-----

**From:** HOAK [mailto:hoak@gomontana.com]  
**Sent:** Friday, April 13, 2001 10:13 AM  
**To:** McCullough, Warren  
**Subject:** TVX Gold & Mineral Hill Mine

Warren,

FYI, TVX Gold continues to suffer the tumultuous change that has characterized and plagued the company since its take-over of Mineral Hill Mine. Chairman and CEO, Eike Batiste, resigned effective end March / first April. Most recent president, Cliff Davis was fired ("... will seek other opportunities..") a week or so ago. The company's share price, following a relatively recent 5:1 reverse split, hit \$.27/share yesterday on the NYSE.

My point, again, is that there are ongoing signs of profound and increasing instability in this company. If the company fails or is sold, the State of Montana could face a substantial unfunded liability for unfinished reclamation work at Mineral Hill Mine. I do not know what authority DEQ has to deal with such difficult-to-quantify risk, but I could make a strong case for regulatory creativity and exceptional caution on behalf of Montana's taxpayers. I recommend that, at the very least, you assure overkill bond coverage.

Best,

JH

04/17/2001





**PUBLIC HEARING ON  
DRAFT ENVIRONMENTAL IMPACT STATEMENT  
TVX MINERAL HILL MINE  
CONSOLIDATED CLOSURE PLAN**

**Wednesday, March 7, 2001 - 7:00 to 9:00pm**

**Gardiner School, Multipurpose Room, Gardiner, MT**

**Transcription**

**JULIA PAGE, President, Bear Creek Council**

I am president now of Bear Creek Council. We have a little plan that I would start and then Bill and Richard and possibly George and possibly some others would speak later, so sorry for the shift. I'd like to say on the outset, we appreciate the work that the DEQ and TVX had done to give us an EIS on this closure plan, a Draft EIS at this point. I know there are some questions in the past when we felt that it took some effort to get both entities to commit to doing an EIS and it is much more helpful for us to be able to see now in one document, this draft, a comprehensive look at the different things that would go into the different components of the cleanup. I think that we have an unusual opportunity with this mine and this mine has been an unusual mine in many respects. It started up and operated without a lot of the, there's a lot of controversy I think still regarding this mine, but this mine did a pretty competent job, I think people agree, in terms of keeping the area clean where they worked and protecting water quality as they did it, of staying in touch with the communities so the community knew what was going on and I think that was very helpful and now, as we face closure and this has been a quicker process from start to finish than many anticipated would happen.

But as we face closure, we have a chance to actually start, operate and finish a mine in good order and if that can happen and we can complete this process I would think this is something that we can all be proud of and it is something that has not happened enough in Montana and really needs to happen more in Montana if we are going to have, if mining is going to be part of the state, at least in my mind, this is what you want to see. This mine has gone through a number of changes and operations since the initial operating plan was issued and so I think this is appropriate that we have a comprehensive look at the closure now.

I think we have, at Bear Creek Council, we have several main concerns: water quality, I think being foremost, really, and is this closure plan addressing issues that need to be and competently addressing these issues. Richard is going to speak more about that.

The revegetation plan, is that going to work? And how is that going to function? And then many other issues that go with this. Those are the two big broad issues. And then the future land use concerns everybody. What will happen to this property

once the closure is complete and TVX would like to leave. TVX would like to move on and they would like to go on to their next venture. And that concerns me a lot. The closure plan refers to the desire to have the Forest Service take over this property. I think in the community, we at Bear Creek Council are in favor of that. We do not want to see subdivision happen up there. We do not want to see commercial development. Turning it over to the Forest Service, there was alluded to some, vaguely alluded to, that this would not subject to the 1872 mining law. I wish that we could have more firm commitment to or understanding what that means in terms of the future use of the property. Is it available to mining? Can we actually have a stipulation that says no, it will not be opened to leasing or something like that? If that were a possibility, we would like to see that included in the Forest Service and the company statement. So that concerns us a great deal and I think it is vague now as to what will happen there.

I think something that would possibly and when you contemplate the Forest Service taking this over, I think a concern of theirs would be, is the work done on the property well enough so that the property can be taken over and it doesn't hold the liability for whoever the subsequent landowner is.

I am quite sure that the Forest Service would be on the lookout for future liability and I am not sure what they would think of an ongoing cost, for instance, to maintain the water treatment facilities. I would like to see in the closure plan some kind of an estimate as to the operating cost for operating, maintaining and monitoring on the water quality aspects of the mine and that would be good. I would assume that it is somewhat tied in with the bonding, but just an estimate of the annual cost, I think this would be helpful for us to know.

In terms of the bonding, I am glad to see that the bonding is now calculated for a hundred years of water treatment, which is I gather is as far out as the department goes.

And so that is good and it is contemplated to be adequate to provide the annual funds to operate this plan, so it seems like a good idea. I would like to see incorporated into the final document so it is available and we can know it, what bonding amounts are proposed for the water treatment and what are the separate amounts that are for the actual reclamation work, so that if the company comes back and wants to get some of their bond back, we would be able to anticipate what that would be for and why, because as I understand it when a bond is released, there would be a public hearing and you would get to comment. Do we think the work has been completed adequately? And the public has a chance at that. And I think if we had some kind of idea up front what we were looking at for that schedule, that would be good.

I think that is basically all I want to say here. Others are going to speak to some of the other issues that we discussed. We are going to submit some written comments by the deadline and we very much appreciate being able to be here and comment on this plan now and see this plan and look at it and try and digest it.

Another question is and has been raised is, there is somewhere in the law a 2-year time frame for the completion of reclamation. It is still unclear to me what that time frame applies to. And now we are in a process, it took about a year to get this draft out, there will be and I think you are going to go through that timetable. I am curious as to when this 2-year time frame starts and what meaning it has. So thanks for the opportunity to comment on this.

**BILL EDWARDS, Vice President, Bear Creek Council**

I am vice-president of the Bear Creek Council and my remarks are going to be confined primarily to the area of revegetation and of noxious weeds. I am a plant ecologist by training and I'd like to say first of all, again thank you for the opportunity to do this. I was at the last meeting and I certainly appreciate the fact you are following through on a number of these comments that were made at the last meeting and I am sure you will follow through on the comments on this one as well.

In general, in terms of the various proposed plans, if you will, that are outlined in here, in general I am in favor of the Agency Modified Plan as I have seen it in here. And in some cases, that doesn't make much of a change on the Applicant's Proposed Plan. For those of you who are familiar with the proposal, I am talking about the Table 2-3 specifically Comparison of Impacts Among Alternatives and related to that. First of all, in the list of things I have here, I think a revegetation specialist does need to be hired to come in and to take a look at the proposed plans and what has been done thus far because some revegetation has already been done. But I think we can learn from what has been done already on the site and that a specialist can give some recommendations, which may help in the long run as far as the ecological succession is concerned on the site of the plants coming back, generally referred to this as a secondary succession after we had this initial disturbance that's occurred there.

I think the bonding which is mentioned in here initially was some \$800 per acre as I recall for the revegetation that has been suggested at \$2,500 per acre. And already, by some feed back from some experts that had looked at it, they've decided that the \$800 just isn't sufficient and I don't know if the \$2,500 is sufficient, but I would say that would be a minimum at least per acre as far as revegetation. Again, only the native species should be used here and in the original plan with some non-native species that was suggested. But I think the rationale behind that is fairly logical. I think most people can see if we can get native vegetation to come in because we are really looking at community development and it's not the individual species as much as it is the total community that's going to be developed ecologically there that is important and native species are what we really need to deal with. I also agree with the idea of having Doug fir, for instance, the seeds or seedlings taken from the immediate area because of the genotypic variation which can occur from place to place even among members of the same species. I used to illustrate to my students by saying, just look at humans and how much they vary over the surface of the planet. They are all the same species. So I think that is pretty important, too.

I also need the proper organic material added, if we're going to add organic material because we can introduce a lot of foreign seeds and noxious weeds seeds if you don't use the proper mix there. Also, the seed mix needs to be I think, modified somewhat, I think. Initially there were too many seeds per acre suggested and that needs to be reduced a little bit.

Monitoring of the vegetation at least for 3 years after the planting occurs, I think, is also important because we do have quite a variation from year to year in a climatic regimes here and so we do need to look at that over several years period of time and to monitor during that time and hopefully the revegetation plan will take into consideration that if some changes need to be made or reseeding needs to be done in these areas, it should be done then. And I think that should be part of the final plan.

With that I think I probably used up more than my 4 minutes, but I appreciate, again, the opportunity and I will be looking forward to our next meeting when we can see what's going on with the revegetation plan and the noxious weed plan. Thank you.

**RICHARD PARKS, Local Businessman and Member of the Bear Creek Council  
(Used the written comments he submitted at the hearing)**

I own and operate a sporting goods store and fishing outfitting service here in Gardiner. Obviously, my interests are tightly bound up with the quality of the water in the Yellowstone River and its tributaries. I appear this evening on my own behalf and as a member of Bear Creek Council, the local affiliate of the Northern Plains Resource Council.

First, let me thank the folks from the department and Amerikanuak for the work that went into preparing the document we have before us. It is a vast improvement over where we were 2 years ago and a considerable advance over the confusion that reigned just about a year ago when the scoping process was initiated. Along the way, the plan itself has obviously matured. Early ideas for water handling that couldn't pass the giggle test have been dropped and we appreciate that.

In reading the draft EIS from the perspective of water quality issues we can identify three remaining areas of concern. These are as follows:

First: I cannot find in the draft any references to operational systems similar to the one proposed to treat the effluent draining from the Tailings Storage Facility. There is, therefore, no data presented that assures the department or the public that the artificial wetland treatment stage will work through the 6 months or so of non-growing season, some of it under very harsh winter conditions. It is not hard to postulate some failure scenarios. For instance – at present the TSF is discharging about 2 gpm, the plan expects under 1 gpm during operation so lets just say 1/2 gpm – that gives us a contaminated iceberg containing 130,000 gallons of effluent. Will the "HDS" system contain this? Will this block of ice degrade the survivability or effectiveness of the HDS

during the summer season? Are there appropriately comparable operational systems that can be referenced in the final EIS to assure us that the answers to these questions are positive and if so, will you cite them?

Second: Looking at Table 3-1 and Figure 3-4 raises questions about the effectiveness of the whole TSF treatment system in the removal of sulfates. SO<sub>4</sub> can easily turn into sulfuric acid with consequent pH problems in any receiving water and/or metals leaching. There seems to be very little room between the predicted performance of the system as revealed in these tables and compliance with water quality standards. What assurance does the department and the public have that any effluent from the HDS will consistently meet standards?

While the proposal provides for dilution of HDS discharges with clean water from the Crevice Adit that raises some other questions. Does this mean that the ephemeral drainage below the TSF will become a perennial stream, and if so, what are the consequences of that and are we certain that it will meet water quality standards?

Third: This CCP assumes that the Forest Service is the final owner of the property.

The reclamation work is supposed to assure them that, in taking the property, they are not taking on a large liability. Being a government agency, the USFS is not required to post a bond and this plan contemplates releasing TVX from its bond once the property is transferred. From the point of view of water quality, this seems potentially optimistic. At the same time, the community has an interest in the long-term management of the property, particularly in how the historic and natural resources of the area can contribute to the local economy. The CCP clearly anticipates that there are long-term operating costs associated with the water treatment systems. These costs would become an obligation of the USFS, or other successor to TVX, but no mechanism is identified to fund these costs. Will the Final EIS identify such a system? If not, will it commit DEQ, TVX, the public, and USFS to a process to identify and establish such a fund?

#### **MIRIAM SKERTICH, Local Resident**

I am Miriam Skertich and I am a resident in Jardine. There might have been something in the EIS, but I never found it and I am curious about what the plans are for the cleanup of the mill area, the area around the mill, the haul road leading from the mill to the tailings and underneath the mill. I want to make sure there is no acid-producing material left. Is the area going to be taken down several feet? I just don't know what the plans are. That was my question.





**APPENDIX G**

**RESPONSES TO MPDES COMMENTS COVER LETTER**

**FINAL MPDES PERMIT AND FACT SHEET**





Montana Department of  
**ENVIRONMENTAL QUALITY**

Judy H. Martz, Governor

P.O. Box 200901 • Helena, MT 59620-0901 • (406) 444-2544 • [www.deq.state.mt.us](http://www.deq.state.mt.us)

April 17, 2001

Dear Commentator:

Thank you for participating in the public process for the application of MPDES Permit Number MT-0030252 for the TVX Mineral Hill Mine, Inc. In accordance with the Administrative Rules of Montana (ARM 17.30.1377) the responses to comments on the permits are inclosed as part of Appendix F in the Final Environmental Impact Statement (EIS). The responses address public concerns that were identified during the public comment period. The public comment period closed February 26, 2001. The draft permit and Fact Sheet was modified in response to these comments as detailed in Appendix E of the Final EIS and summarized below.

1. The monitoring frequency for Outfall 005B was changed from yearly to quarterly.
2. If one of the contingency plans, described in the Fact Sheet, for discharge is anticipated the Water Protection Bureau must be notified prior to implementation.
3. The Fact Sheet has been modified to state that if the contingency Outfall No. 006 were permitted it would have to meet all applicable standards including nondegradation of any increased source not previously discharge at an established outfall.

In accordance with ARM 17.30.1378, the Department's final decision to issue the permit is effective 30 days after service of this notice. The applicant may appeal this decision within 30 days of receipt of this notice in accordance with 75-5-403, MCA.

The Department wishes to thank those individuals who provided comment on the permit. If you have any questions, please contact Terry Webster at (406) 444-1455 or email [[twebster@state.mt.us](mailto:twebster@state.mt.us)].

Sincerely,

Thomas D. Reid, Supervisor  
Water Protection Discharge Permit Section  
Water Protection Bureau

Enclosure



Minor Industrial  
No Bio-monitoring  
Permit No.: MT-0030252

## MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

### AUTHORIZATION TO DISCHARGE UNDER THE MONTANA POLLUTANT DISCHARGE ELIMINATION SYSTEM (MPDES)

In compliance with Mont. Code Annot. Section 75-5-101 *et seq.* and ARM Title 17, Chapter 30, Subchapters 5, 6, 7, and 13.

TVX Mineral Hill Mine  
PO Box 92  
Gardiner, MT 59030

is authorized to discharge **unaltered ground water from the Crevice Adit, treated wastewater from the tailing storage facility and treated mine adit water from the 1300 Adit**

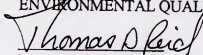
to receiving waters named **Bear Creek and ground water respectively,**

in accordance with discharge point(s), effluent limitations, monitoring requirements and other conditions set forth herein. Authorization for discharge is limited to those outfalls specifically listed in the permit. Specified load allocations support and serve to define total maximum daily loads for the receiving waters affected.

This permit shall become effective June 1, 2001.

This permit and the authorization to discharge shall expire at midnight on May 31, 2006.

FOR THE MONTANA DEPARTMENT OF  
ENVIRONMENTAL QUALITY



Thomas D. Reid, Supervisor  
Water Quality Discharge Permit Section  
Water Protection Bureau

Dated this 23 day of April, 2001

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I. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

A. Definitions.

1. The **"30-day (and monthly) average,"** other than for fecal coliform bacteria, is the arithmetic average of all samples collected during a consecutive 30-day period or calendar month, whichever is applicable. Geometric means shall be calculated for fecal coliform bacteria. The calendar month shall be used for purposes of reporting self-monitoring data on discharge monitoring report forms.
2. The **"7-day (and weekly) average,"** other than for fecal coliform bacteria, is the arithmetic mean of all samples collected during a consecutive 7-day period or calendar week, whichever is applicable. Geometric means shall be calculated for fecal coliform bacteria. The 7-day averages are applicable only to those effluent characteristics for which there are 7-day average effluent limitations. The calendar week which begins on Sunday and ends on Saturday, shall be used for purposes of reporting self-monitoring data on discharge monitoring report forms. Weekly averages shall be calculated for all calendar weeks in the month that have at least 4 days. For example, if a calendar week overlaps two months, the weekly average is calculated only in the month that contains four or more days of that week.
3. The **"Annual Average Load"** is the arithmetic mean of all 30-day or monthly average loads reported during the calendar year for a monitored parameter.
4. The **"Arithmetic Mean"** or **"Arithmetic Average"** for any set of related values means the summation of the individual values divided by the number of individual values.
5. **"BOD<sub>5</sub>"** is the five-day measure of pollutant parameter biochemical oxygen demand.
6. **"Bypass"** means the intentional diversion of waste streams from any portion of a treatment facility.
7. **"CBOD<sub>5</sub>"** is the five-day measure of pollutant parameter carbonaceous biochemical oxygen demand.
8. **"Composite samples"** shall be flow proportioned. The composite sample shall, as a minimum, contain at least four (4) samples collected over the compositing period. Unless otherwise specified, the time between the collection of the first sample and the last sample shall not be less than six (6) hours nor more than 24 hours. Acceptable methods for preparation of composite samples are as follows:
  - a. Constant time interval between samples, sample volume proportional to flow rate at time of sampling;
  - b. Constant time interval between samples, sample volume proportional to total flow (volume) since last sample. For the first sample, the flow rate at



the time the sample was collected may be used;

- c. Constant sample volume, time interval between samples proportional to flow (i.e., sample taken every "X" gallons of flow); and,
  - d. Continuous collection of sample, with sample collection rate proportional to flow rate.
- 9. A **"Daily Maximum Limit"** specifies the maximum allowable discharge of a pollutant during a calendar day. Expressed as units of mass, the daily discharge is cumulative mass discharged over the course of the day. Expressed as a concentration, it is the arithmetic average of all measurements taken that day.
  - 10. **"Department"** means the Montana Department of Environmental Quality (MDEQ).
  - 11. **"EPA"** means the United States Environmental Protection Agency.
  - 12. A **"grab"** sample, for monitoring requirements, is defined as a single "dip and take" sample collected at a representative point in the discharge stream.
  - 13. An **"instantaneous"** measurement, for monitoring requirements, is defined as a single reading, observation, or measurement.
  - 14. **"Load limits"** are mass-based discharge limits expressed in units such as lb/day.
  - 15. A **"mixing zone"** is a limited area of a surface water body or aquifer where initial dilution of a discharge takes place and where water quality changes may occur. Also recognized as an area where certain water quality standards may be exceeded.
  - 16. **"Nondegradation"** means the prevention of a significant change in water quality that lowers the quality of high-quality water for one or more parameters. Also, the prohibition of any increase in discharge that exceeds the limits established under or determined from a permit or approval issued by the Department prior to April 29, 1993.
  - 17. **"Severe property damage"** means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.
  - 18. **"Sewage Sludge"** is any solid, semi-solid or liquid residue that contains materials removed from domestic sewage during treatment. Sewage sludge includes, but is not limited to, primary and secondary solids and sewage sludge products.
  - 19. The term **"TMDL"** means the total maximum daily load limitation of a parameter, representing the estimated assimilative capacity for a water body before other designated uses are adversely affected. Mathematically, it is the sum of wasteload

allocations for point sources, load allocations for non-point and natural background sources, and a margin of safety.

20. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

B. Description of Discharge Points

The authorization to discharge provided under this permit is limited to those outfalls specifically designated below as discharge locations. Discharges at any location not authorized under an MPDES permit is a violation of the Montana Water Quality Act and could subject the person(s) responsible for such discharge to penalties under the Act. Knowingly discharging from an unauthorized location or failing to report an unauthorized discharge within a reasonable time from first learning of an unauthorized discharge could subject such person to criminal penalties as provided under Section 75-5-632 of the Montana Water Quality Act.

Outfall

Serial Number Description of Discharge Point

- |        |   |
|--------|---|
| 001    | The discharge consists of unaltered ground water from the Crevice Adit at the end of the discharge pipe, emptying to Bear Creek, located approximately 45° 04' 08" N latitude, 110° 38' 05" W longitude. The mixing zone extends from the point of discharge into Bear Creek to a point 100 feet downstream, approximately 10 river widths. |
| 002    | The discharge consists of treated water from the tailing storage facility, which discharges to Bear Creek, located approximately 45° 04' 05" N latitude, 110° 37' 43" W longitude. The mixing zone extends from the point of discharge into Bear Creek to a point 100 feet downstream, approximately 10 river widths.                       |
| 005A&B | The discharge consists of treated mine drainage discharging to ground water from two septic drainfields located approximately 45° 03' 57" N latitude, 110° 38' 07" W longitude. The mine drainage is mixed with sanitary waste prior to discharge. No mixing zone is required.  |

C. Specific Limitations

Wastewater Effluent Limitations

Effective immediately and lasting through the term of the permit, the quality of effluent discharged by the facility shall, as a minimum, meet the limitations as set forth below:

Outfall 001

TABLE 1. NUMERIC EFFLUENT LIMITS

Parameter	Concentration (mg/L) <sup>(1)(2)</sup>	
	30-Day Average	Instantaneous Maximum
Total Suspended Solids (TSS)	20	30
Arsenic, Total Recoverable	0.044	0.066

- (1) See the definitions in Part I.A for explanation of terms.
- (2) For determination of metals use Total Recoverable method of digestion in *Methods for the Chemical Analysis of Water and Wastes*, Section 4.1. EPA-600/4-79-020, revised 1983. Use EPA or Department approved, methods of analyses after digestion (40 CFR 136.3).

Effluent pH shall remain between 6.0 and 9.0

There shall be no acute toxicity in the effluent discharged by the facility and no chronic toxicity outside the boundaries of the mixing zone.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

There shall be no discharge which causes visible oil sheen in the receiving stream.

There shall be no discharge of wastewater, which reacts or settles to form an objectionable sludge deposit or emulsion beneath the surface of the receiving stream or upon adjoining shorelines.

Outfall 002

TABLE 2. (flow limits in Bear Creek at the 7Q10 (6 cfs))

Parameter	Concentration (mg/L) <sup>(1)</sup>	
	30-Day Average	Instantaneous Maximum
Total Suspended Solids	20	30
Total Recoverable <sup>(2)</sup> Cadmium	0.0057	0.0085
Total Recoverable Copper	0.03	0.045
Total Recoverable Iron	5.6	8.4
Total Recoverable Manganese	0.281	.422
Total Recoverable Lead, <sup>(4)</sup>	0.00028	0.00042
Total Recoverable Zinc	0.289	0.434
Total Recoverable Mercury, <sup>(4)</sup>	0.000006	0.000009
Total Recoverable Arsenic	0.0053	0.0077
Total Recoverable Cyanide, <sup>(5)</sup>	0.27	0.41
Total Nitrogen as N <sup>(3)</sup>	6.0	9.0

- (1) See the definitions in Part I.A for explanation of terms.
- (2) For determination of metals use Total Recoverable method of digestion in *Methods for the Chemical Analysis of Water and Wastes*, Section 4.14 EPA-600/4-79-020, revised 1983. Use EPA or Department approved, methods of analyses after digestion (40 CFR 136.3).
- (3) Total nitrogen as N includes: nitrate/nitrite as N, thiocyanate/cyanate as N, and total ammonia as N. Analysis below the detection limit will be considered 1/2 the detection limit for the total nitrogen calculation.
- (4) For the purposes of determining compliance with the effluent limitations the permittee shall use the Required Reporting Values (RRV) listed in DEQ Circular WQB-7. The sample results shall be deemed in compliance with the terms of this permit if the sample result is less than the RRV.
- (5) The discharge limit assumes zero background cyanide in Bear Creek.
- (6) Flow must be reported from calibrated staff gauge on a weekly basis.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

There shall be no discharge, which causes visible oil sheen in the receiving stream.

The pH of the discharge shall remain between 6.0 and 9.0 std units.

There shall be no acute toxicity in the effluent discharged by the facility and no chronic toxicity outside the boundaries of the mixing zone.

Outfall 005A&B

TABLE 5. NUMERIC EFFLUENT LIMITS

Parameter	Concentration (mg/L) <sup>(1)(2)</sup>	
	30-Day Average	Instantaneous Maximum
Arsenic, Dissolved	0.036	Not Applicable

(1) See the definitions in Part I.A for explanation of terms.

(2) For determination of metals use dissolved method in *Methods for the Chemical Analysis of Water and Wastes*, Section 4.1. EPA-600/4-79-020, revised 1983

Effluent pH shall remain between 6.0 and 9.0

D. Self-Monitoring and Notification Requirements

1. Wastewater Discharge Monitoring

As a minimum, upon the effective date of this permit, the following constituents shall be monitored at the frequency and with the type of measurement indicated; samples or measurements shall be representative of the volume and nature of the monitored discharge. If no discharge occurs during the entire monitoring period, it shall be stated on the Discharge Monitoring Report Form (EPA No. 3320-1) that no discharge or overflow occurred.

**Outfall 001:** Compliance sample shall be collected prior to discharge to the Bear Creek.

TABLE 6. EFFLUENT MONITORING REQUIREMENTS

Parameter	Frequency	Type <sup>(1)</sup>
Effluent Flow Rate, gpm	Quarterly	Instantaneous
Total Suspended Solids, mg/L	Quarterly	Grab
pH, standard units	Quarterly	Instantaneous
Total Recoverable Arsenic, mg/L	Quarterly	Grab
Total Recoverable Cadmium, mg/L	Quarterly	Grab

<sup>(1)</sup> See the definitions in Part I.A. of the permit.

**Outfall 002:** Compliance sample shall be collected prior to discharge to the Bear Creek.

**TABLE 7. EFFLUENT MONITORING REQUIREMENTS**

Parameter	Frequency	Type <sup>(1)</sup>
Effluent Flow Rate, gpm	Daily	Instantaneous
Total Suspended Solids, mg/l	Weekly	Grab
Total Recoverable Cadmium, mg/l	Weekly	Grab
Total Recoverable Copper, mg/l	Weekly	Grab
Total Recoverable Iron, mg/l	Weekly	Grab
Total Recoverable Manganese, mg/l	Weekly	Grab
Total Recoverable Lead, mg/l	Weekly	Grab
Total Recoverable Zinc, mg/l	Weekly	Grab
Total Recoverable Cyanide, mg/l	Weekly	Grab
Total Recoverable Mercury, mg/l	Weekly	Grab
Total Recoverable Arsenic, mg/l	Weekly	Grab
pH, Std Units	Weekly	Grab
Total Ammonia as N, mg/l	Weekly	Grab
Thiocyanate plus Cyanate as N, mg/l	Weekly	Grab
Nitrate plus Nitrite as N, mg/l	Weekly	Grab
Total Nitrogen as N	Weekly	Calculated

(1) See the definitions in Part I.A. of the permit.

**Outfall 005A:** Compliance samples shall be collected prior to discharge into the septic system.

**TABLE 8. EFFLUENT MONITORING REQUIREMENTS**

Parameter	Frequency	Type <sup>(1)</sup>
Effluent Flow Rate, gpm	Monthly	Instantaneous
pH, standard units	Monthly	Instantaneous
Dissolved Arsenic, mg/L	Monthly	Grab

(1) See the definitions in Part I.A. of the permit.

Outfall 005B:

TABLE 9. EFFLUENT MONITORING REQUIREMENTS

Parameter	Frequency	Type <sup>(1)</sup>
Effluent Flow Rate, gpm	Quarterly	Instantaneous
Dissolved Arsenic, mg/L	Quarterly	Grab
Total Recoverable, Arsenic, mg/L	Quarterly	Grab

<sup>(1)</sup> See the definitions in Part I.A. of the permit.

2. Notification of Contingency Plans

If one of the contingency plans, described in the Fact Sheet, for discharge is anticipated the Water Protection Bureau must be notified prior to implementation.

II. MONITORING RECORDING AND REPORTING REQUIREMENTS

- A. Representative Sampling. Samples taken in compliance with the monitoring requirements established under Part I shall be collected from the effluent stream prior to discharge into the receiving waters. Samples and measurements shall be representative of the volume and nature of the monitored discharge.
- B. Monitoring Procedures. Monitoring must be conducted according to test procedures approved under Part 136, Title 40 of the Code of Federal Regulations, unless other test procedures have been specified in this permit. All flow-measuring and flow-recording devices used in obtaining data submitted in self-monitoring reports must indicate values within 10 percent of the actual flow being measured.
- C. Penalties for Tampering. The Montana Water Quality Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than \$10,000, or by imprisonment for not more than six months, or by both.
- D. Reporting of Monitoring Results. Self-monitoring results will be reported monthly. Monitoring results obtained during the previous reporting period shall be summarized and reported on a Discharge Monitoring Report Form (EPA No. 3320-1), postmarked no later than the 28th day of the month following the completed reporting period. If no discharge occurs during the reporting period, "no discharge" shall be reported. Legible copies of these, and all other reports required herein, shall be signed and certified in accordance with the "Signatory Requirements" (see Part IV.G of this permit), and submitted to the Department at the following address:

Montana Department of Environmental Quality  
Water Protection Bureau  
P.O. Box 200901  
Helena, Montana 59620-0901  
Phone: (406) 444-3080



- E. Compliance Schedules. Reports of compliance or noncompliance with, or any progress reports on interim and final requirements contained in any Compliance Schedule of this permit shall be submitted no later than 14 days following each schedule date.
- F. Additional Monitoring by the Permittee. If the permittee monitors any pollutant more frequently than required by this permit, using approved analytical methods as specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the Discharge Monitoring Report. Such increased frequency shall also be indicated.
- G. Records Contents. Records of monitoring information shall include:
1. The date, exact place, and time of sampling or measurements;
  2. The initials or name(s) of the individual(s) who performed the sampling or measurements;
  3. The date(s) analyses were performed;
  4. The time analyses were initiated;
  5. The initials or name(s) of individual(s) who performed the analyses;
  6. References and written procedures, when available, for the analytical techniques or methods used; and
  7. The results of such analyses, including the bench sheets, instrument readouts, computer disks or tapes, etc., used to determine these results.
- H. Retention of Records. The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least three years from the date of the sample, measurement, report or application. This period may be extended by request of the Department at any time. Data collected on site, copies of Discharge Monitoring Reports, and a copy of this MPDES permit must be maintained on site during the duration of activity at the permitted location.
- I. Twenty-four Hour Notice of Noncompliance Reporting.
1. The permittee shall report any serious incidents of noncompliance as soon as possible, but no later than twenty-four (24) hours from the time the permittee first became aware of the circumstances. The report shall be made to the Water Protection Bureau at (406) 444-3080 or the Office of Disaster and Emergency Services at (406) 841-3911. The following examples are considered serious incidents:

- a. Any noncompliance which may seriously endanger health or the environment;
  - b. Any unanticipated bypass which exceeds any effluent limitation in the permit (See Part III.G of this permit, "Bypass of Treatment Facilities"); or
  - c. Any upset which exceeds any effluent limitation in the permit (See Part III.H of this permit, "Upset Conditions").
2. A written submission shall also be provided within five days of the time that the permittee becomes aware of the circumstances. The written submission shall contain:
    - a. A description of the noncompliance and its cause;
    - b. The period of noncompliance, including exact dates and times;
    - c. The estimated time noncompliance is expected to continue if it has not been corrected; and
    - d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.
  3. The Department may waive the written report on a case-by-case basis if the oral report has been received within 24 hours by the Water Protection Bureau, by phone, (406) 444-3080.
  4. Reports shall be submitted to the addresses in Part II.D of this permit, "Reporting of Monitoring Results".
- J. Other Noncompliance Reporting. Instances of noncompliance not required to be reported within 24 hours shall be reported at the time that monitoring reports for Part II.D of this permit are submitted. The reports shall contain the information listed in Part II.I.2 of this permit.
- K. Inspection and Entry. The permittee shall allow the head of the Department or the EPA or an authorized representative thereof, upon the presentation of credentials and other documents as may be required by law, to:
1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;
  2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
  3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

4. Sample or monitor at reasonable times, for the purpose of assuring permit compliance, any substances or parameters at any location.

### III. COMPLIANCE RESPONSIBILITIES

- A. Duty to Comply. The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application. The permittee shall give the Department advance notice of any planned changes at the permitted facility or of an activity which may result in permit noncompliance.
- B. Penalties for Violations of Permit Conditions. The Montana Water Quality Act provides that any person who violates a permit condition of the Act is subject to civil or criminal penalties not to exceed \$10,000 per day of such violation. Any person who willfully or negligently violates permit conditions of the Act is subject to a fine of not more than \$50,000 per day of violation, or by imprisonment for not more than 2 years, or both, for subsequent convictions. MCA 75-5-611(a) also provides for administrative penalties not to exceed \$10,000 for each day of violation and up to a maximum not to exceed \$100,000 for any related series of violations. Except as provided in permit conditions on Part III.G of this permit, "Bypass of Treatment Facilities" and Part III.H of this permit, "Upset Conditions", nothing in this permit shall be construed to relieve the permittee of the civil or criminal penalties for noncompliance.
- C. Need to Halt or Reduce Activity not a Defense. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.
- D. Duty to Mitigate. The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.
- E. Proper Operation and Maintenance. The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit. However, the permittee shall operate, as a minimum, one complete set of each main line unit treatment process whether or not this process is needed to achieve permit effluent compliance.
- F. Removed Substances. Collected screenings, grit, solids, sludges, or other pollutants removed in the course of treatment shall be disposed of in such a manner so as to prevent any pollutant from entering any waters of the state or creating a health hazard. Any sludges removed from the facility shall be disposed of in accordance with 40 CFR 503, 258 or other

applicable rule. EPA and MDEQ shall be notified at least 180 days prior to such disposal taking place.

G. Bypass of Treatment Facilities:

1. Bypass not exceeding limitations. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of Parts III.G.2 and III.G.3 of this permit.
2. Notice:
  - a. Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least 10 days before the date of the bypass.
  - b. Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required under Part II.I of this permit, "Twenty-four Hour Reporting".
3. Prohibition of bypass.
  - a. Bypass is prohibited and the Department may take enforcement action against a permittee for a bypass, unless:
    - (1) The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
    - (2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgement to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and
    - (3) The permittee submitted notices as required under Part III.G.2 of this permit.
  - b. The Department may approve an anticipated bypass, after considering its adverse effects, if the Department determines that it will meet the three conditions listed above in Part III.G.3.a of this permit.

H. Upset Conditions.

1. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with technology based permit effluent limitations if the requirements of Part III.H.2 of this permit are met. No determination made during

administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review (i.e., Permittees will have the opportunity for a judicial determination on any claim of upset only in an enforcement action brought for noncompliance with technology-based permit effluent limitations).

2. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:
    - a. An upset occurred and that the permittee can identify the cause(s) of the upset;
    - b. The permitted facility was at the time being properly operated;
    - c. The permittee submitted notice of the upset as required under Part II.I of this permit, "Twenty-four Hour Notice of Noncompliance Reporting"; and
    - d. The permittee complied with any remedial measures required under Part III.D of this permit, "Duty to Mitigate".
  3. Burden of proof. In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof.
- I. Toxic Pollutants. The permittee shall comply with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.
  - J. Changes in Discharge of Toxic Substances. Notification shall be provided to the Department as soon as the permittee knows of, or has reason to believe:
    1. That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":
      - a. One hundred micrograms per liter (100 µg/l);
      - b. Two hundred micrograms per liter (200 µg/l) for acrolein and acrylonitrile; five hundred micrograms per liter (500 µg/l) for 2,4-dinitrophenol and for 2-methyl-4, 6-dinitrophenol; and one milligram per liter (1 mg/l) for antimony;
      - c. Five (5) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7); or
      - d. The level established by the Department in accordance with 40 CFR 122.44(f).

2. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":
  - a. Five hundred micrograms per liter (500 µg/l);
  - b. One milligram per liter (1 mg/l) for antimony;
  - c. Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7); or
  - d. The level established by the Department in accordance with 40 CFR 122.44(f).

#### IV. GENERAL REQUIREMENTS

- A. Planned Changes. The permittee shall give notice to the Department as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when the alteration or addition could significantly change the nature or increase the quantity of pollutant discharged. This notification applies to pollutants which are not subject to effluent limitations in the permit.
- B. Anticipated Noncompliance. The permittee shall give advance notice to the Department of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.
- C. Permit Actions. This permit may be revoked, modified and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.
- D. Duty to Reapply. If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. The application must be submitted at least 180 days before the expiration date of this permit.
- E. Duty to Provide Information. The permittee shall furnish to the Department, within a reasonable time, any information which the Department may request to determine whether cause exists for revoking, modifying and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Department, upon request, copies of records required to be kept by this permit.
- F. Other Information. When the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or any report to the Department, it shall promptly submit such facts or information with a narrative explanation of the circumstances of the omission or incorrect submittal and why



they weren't supplied earlier.

G. Signatory Requirements. All applications, reports or information submitted to the Department shall be signed and certified.

1. All permit applications shall be signed as follows:
  - a. For a corporation: by a responsible corporate officer;
  - b. For a partnership or sole proprietorship: by a general partner or the proprietor, respectively;
  - c. For a municipality, State, Federal, or other public agency: by either a principal executive officer or ranking elected official.
2. All reports required by the permit and other information requested by the Department shall be signed by a person described above or by a duly authorized representative of that person. A person is considered a duly authorized representative only if:
  - a. The authorization is made in writing by a person described above and submitted to the Department, and
  - b. The authorization specified either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)
3. Changes to authorization. If an authorization under Part IV.G.2 of this permit is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Part IV.G.2 of this permit must be submitted to the Department prior to or together with any reports, information, or applications to be signed by an authorized representative.
4. Certification. Any person signing a document under this section shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and



complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

- H. Penalties for Falsification of Reports. The Montana Water Quality Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction be punished by a fine of not more than \$25,000 per violation, or by imprisonment for not more than six months per violation, or by both.
- I. Availability of Reports. Except for data determined to be confidential under 40 CFR Part 2, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Department. As required by the Clean Water Act, permit applications, permits and effluent data shall not be considered confidential.
- J. Oil and Hazardous Substance Liability. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Clean Water Act.
- K. Property or Water Rights. The issuance of this permit does not convey any property or water rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.
- L. Severability. The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.
- M. Transfers. This permit may be automatically transferred to a new permittee if:
  - 1. The current permittee notifies the Department at least 30 days in advance of the proposed transfer date;
  - 2. The notice includes a written agreement between the existing and new permittees containing a specific date for transfer of permit responsibility, coverage, and liability between them;
  - 3. The Department does not notify the existing permittee and the proposed new permittee of an intent to revoke or modify and reissue the permit. If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in Part VI.M.2 of this permit; and
  - 4. Required annual and application fees have been paid.

- N. Fees. The permittee is required to submit payment of an annual fee as set forth in ARM 17.30.201. If the permittee fails to pay the annual fee within 90 days after the due date for the payment, the Department may:
1. Impose an additional assessment consisting of 15% of the fee plus interest on the required fee computed at the rate established under 15-31-510(3), MCA, or
  2. Suspend the processing of the application for a permit or authorization or, if the nonpayment involves an annual permit fee, suspend the permit, certificate or authorization for which the fee is required. The Department may lift suspension at any time up to one year after the suspension occurs if the holder has paid all outstanding fees, including all penalties, assessments and interest imposed under this sub-section. Suspensions are limited to one year, after which the permit will be terminated.
- O. Reopener Provisions. This permit may be reopened and modified (following proper administrative procedures) to include the appropriate effluent limitations (and compliance schedule, if necessary), or other appropriate requirements if one or more of the following events occurs:
1. Water Quality Standards: The water quality standards of the receiving water(s) to which the permittee discharges are modified in such a manner as to require different effluent limits than contained in this permit.
  2. Water Quality Standards are Exceeded: If it is found that water quality standards or trigger values in the receiving stream are exceeded either for parameters included in the permit or others, the department may modify the effluent limits or water management plan.
  3. TMDL or Wasteload Allocation: TMDL requirements or a wasteload allocation is developed and approved by the Department and/or EPA for incorporation in this permit.
  4. Water Quality Management Plan: A revision to the current water quality management plan is approved and adopted which calls for different effluent limitations than contained in this permit.
  5. Toxic Pollutants: A toxic standard or prohibition is established under Section 307(a) of the Act for a pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitation for such pollutant in his permit.

